Traffic Engineering

OFFICIAL PUBLICATION OF THE INSTITUTE OF TRAFFIC ENGINEERS

VOLUME XX | JANUARY, 1950 | NUMBER 4

Traffic Engineering is that phase of engineering which deals with the planning and geometric design of streets, highways, and abutting lands, and with traffic operation thereon, as their use is related to the safe, convenient, and economic transportation of persons and goods.

COVER: Illustration of modern route signing practice adopted by the Michigan Highway Department.

Michigan State Highway Department

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May We Offer . . .

One-Way Street Experience of Cities 153
Robert D. Dier

City Traffic Administration 156
J. A. Carrothers

The Effect of an Off-Street Parking Garage as a Traffic Generator 158
Willard H. Armstrong

Off-Street Parking News Round-Up 163
LeVerne Johnson

Reference Notes 166
Victor G. Hofer

Traffic Trends 167

Open Discussion 169
T. L. Johnson

Traffic News 171

Traffic Engineer's Quiz 171

Looking Ahead 178

Index to Advertisers ..... Inside Back Cover

Published Monthly by the

Institute of Traffic Engineers

PUBLICATION office:
Interstate Printing Corp.
400 Watchung Avenue
Plainfield, New Jersey

EDITORIAL AND ADVERTISING offices:
212 Strathcona Hall
New Haven 11, Connecticut

Entered as second-class matter November 7, 1941, at the Post Office at Plainfield, New Jersey, under Act of March 3, 1879. ¶Single copies 40 cents, subscription price $3.50 per year in the United States; $2.00 per year to members. Other publications of the **Institute of Traffic Engineers** include Annual Proceedings, Traffic Engineering Handbook and Technical Bulletins. ¶**The Institute is not responsible for any statements made or opinions expressed in its publications.** Permission to reprint contents with customary credit line is given unless otherwise stated.

LETTERS TO THE EDITORS

TAXI CAB STANDS

If the picture in the lower left corner of page 82, November issue, is a taxi stand in Wichita, Kansas, I am now in Chicago, Illinois! I've waited for people to get off trains for a good part of my life at this back entrance to a railroad station.

FRANCIS E. TWISS
International Road Federation
Washington, D. C.

● Further investigation proves Mr. Twiss, a long-time resident of Hartford, Connecticut, to be correct. Since the captions were apparently switched, the caption on page 80 should go under the picture on page 82, and vice versa.—ED.

GENERAL

The first issue of TRAFFIC ENGINEERING in its new format is excellent! The new size and shape permit much better treatment of illustrations and the over-all impression is a much more professional appearing magazine. You are to be congratulated for making a splendid improvement.

D. GRANT MICKLE
Automotive Safety Foundation
Washington, D. C.

Congratulations on the new format of the TRAFFIC ENGINEERING magazine. The size of the magazine, the style of type and the numerous illustrations make it much more readable than its former size. I hope that your future efforts will be as successful as the first of the large size issues.

LLOYD M. BRAFF
DeLeuw, Cather & Company
Chicago, Illinois

I just received my second copy of the "New Look" TRAFFIC ENGINEERING magazine. Sincerely, all of you are to be congratulated on the wonderful job you are doing. I know the publication will continue to be a tremendous success. I hope that some day every City Engineer throughout the country will be in a position to get this magazine each month.

HARRY PORTER JR.
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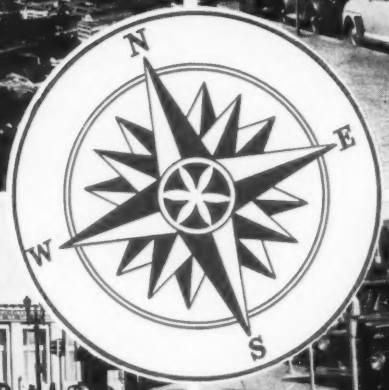

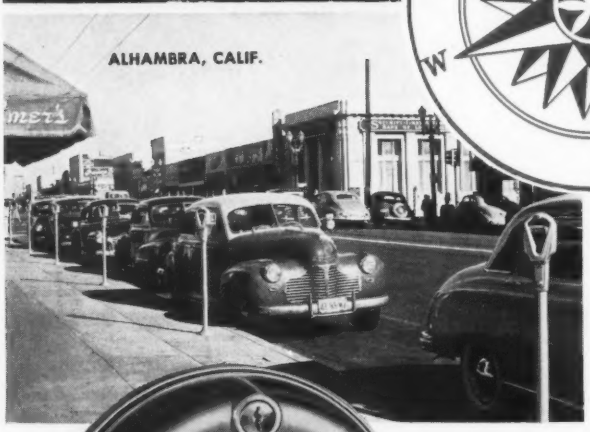

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Frankly Speaking

Much has been said about men who forget their manners when they get behind the wheel of an automobile. Has it ever occurred to anyone that inadequate street and highway facilities may have an important bearing on driver conduct?

Comment on bad motor manners usually carries the implication that the behavior of the same persons is beyond reproach elsewhere. This is not the fact. While some people are courteous in all circumstances, there are many who are only "fair-weather" gentlemen. Men whose manners are perfect at a dinner where there are as many place settings as guests, are frequently found pushing rudely into line at a banquet where the seating capacity is limited. If we need any further illustration, we have only to remember the manner in which many people tried to get scarce articles of food during the war.

Just as providing ample food supplies removes one cause of bad table manners, so better highways might improve the general level of motor manners. But building all the facilities needed to permit traffic to flow freely everywhere at all times is out of the question. We must do the best we can with what we have. We resort to rationing when food is scarce, and we must rely on traffic control where highways are inadequate. As an example of how this affects motor manners, we need only cite the generally satisfactory observance of stop-and-go signals, and contrast this with the contention for the right-of-way at unsignalized heavy-traffic intersections.

Success of food rationing requires careful planning and organization, likewise traffic control requires careful engineering consideration. Even simple things such as sign placement, street lights or no-passing stripes must be based on careful study to determine how to make it easy for drivers to do the right thing.

There is no simple magic formula for improving motor manners. But certainly the traffic engineer has a large responsibility as well as a good opportunity to encourage driver courtesy by removing or mitigating the causes of friction. At the same time he must realize that he cannot deal only with vehicle counts and accident statistics and other engineering data. He must remember that engineering is only one factor in the traffic and safety program, and he must always cooperate with the agencies of enforcement and education. In all phases of his work he must remember that he is dealing with human beings. He must be a student of psychology and understand the human mind if he hopes to improve motor manners.

J. H. Darnell

Director

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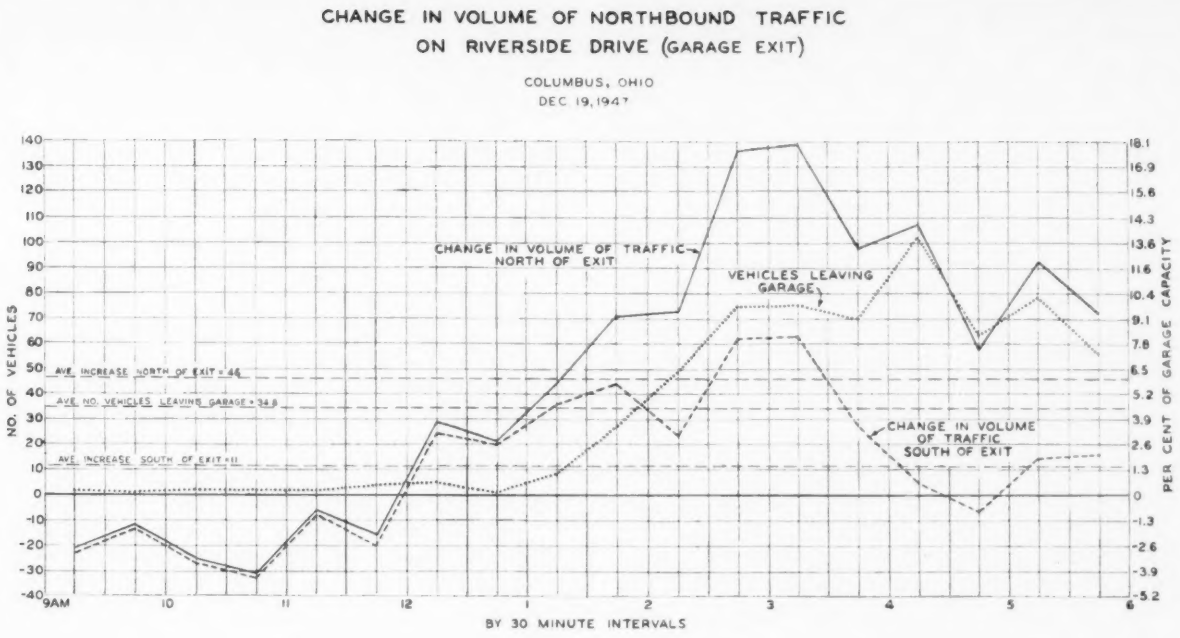


Fig. 4

During these periods when the reservoir was filled to capacity, a garage attendant would direct the line of waiting vehicles in the street to proceed on past the entrance. These same vehicles were then observed to cruise around the block in the hope that the reservoir would be sufficiently empty on the following trip to permit them to enter. This action resulted in additional traffic flow and accounted in a large measure for the increase of 206 vehicles south of the exit on Riverside Drive as well as the right turning movements around the garage.

The average time to park a vehicle in this garage during peak periods was 7 minutes per attendant. With 18 attendants employed, the vehicles were stored at an average rate of 18 every 7 minutes or approximately 13 in a 5-minute period. Beginning at 12:20 P.M. when 17 vehicles entered the garage reservoir, the accumulation of entering vehicles began to exceed the rate at which the attendants could dispose of them. Of these 17 entering vehicles in that 5-minute period, 13 were stored, leaving an accumulation of 4 vehicles to be added to the 20 cars entering the reservoir in the following 5-minute period from 12:25 to 12:30 P.M. At this point, the garage reservoir, with a capacity of 25 cars, was completely filled and additional cars desiring to enter the garage were waved away. As a result the number of vehicles beyond the garage entrance increased sharply from 4 vehicles in the preceding 5-minute interval to 14 vehicles in the period from 12:30 to 12:35 P.M.

Similarly, in the period from 12:55 to 1:00 P.M. when vehicles entered the reservoir, filling it to capacity, the volume of traffic beyond the entrance increased from 6 vehicles in the preceding 5-minute period to 15 vehicles as other prospective customers were turned away. This condition occurred repeatedly during the period of peak demand, resulting in increased traffic flow on the street as the motorists circled the garage seeking an opportunity to enter upon the succeeding trip.

The rate of arrival of customers at a parking garage is not uniform and if the reservoir space is insufficient to accommodate the peak loads, then an appropriate number of attendants must be employed to maintain a rate of storing vehicles which is commensurate with the demand. Otherwise the generated traffic on the adjacent streets will be further increased by the volume of cars turned away from the facility.

Summary

Under conditions which were representative of a large seasonal peak demand for shopper parking, the following conclusions may be drawn as to the extent to which the operation of an off-street parking facility with a capacity of 772 cars may generate additional traffic on the adjacent streets:

1. During the "after" study there was an increase of 12.4% in the total volume of traffic on the adjacent streets, of which 11.3% was directly attributable to vehicles entering and leaving the garage. In other words, 91% of the total increase in traffic was due to the garage.
2. An average of 48% of the traffic on the entrance street entered the garage during the nine-hour period of the "after" study.
3. The demand for parking during the 9-hour period of the study resulted in an increase of 72% in the volume of traffic on the street in advance of the garage entrance.

(See PARKING GARAGE, *page 168)*

The peak number of right turning movements occurred between 3:30 P.M. and 4:00 P.M. when 115 right turning vehicles entered Ludlow Street. This is an increase of 117% over the previous number of 53 right turns during the same period of time before the opening of the garage. The peak net increase in right turns occurred between 1:00 P.M. and 1:30 P.M. when 72 vehicles turned into Ludlow Street or an increase of 266%. This peak half hour increase of 72 right turns corresponds to 9.5% of the garage capacity.

It is significant to note that under the peak conditions in a 30-minute period, there were more than 100% increases in both the left and right turning movements, with these values ranging as high as 300% for left turns and 266% for right turns.

During the peak 5 minute period for left turns between 12:55 P.M. and 1:00 P.M. there was a 320% increase in turning movements. During that same 5 minute period which was the period with maximum increase in traffic on Ludlow Street, 19 vehicles turned right or an increase of 533%. Of this total of 40 cars turning into Ludlow Street, 25 or 62.5% of them entered the garage.

Effect of Discharge of Vehicles From Garage

The flow of vehicles from a garage and the number in which they mix with the movement of the existing street traffic must be given the same consideration as the arrival of the cars in the garage. If a parking garage dumps its stored vehicles onto a major artery in large numbers during peak hours, it may result in disrupting the smooth flow of traffic on the street and create further congestion and delay.

As may be seen from Figure 2, there was an increase of 833 north bound vehicles, or 26%, between the garage exit and the intersection of Riverside Drive and West Town Street during the nine-hour period of the "after" study. Of this increase, 627 vehicles, or 75.2% of the total increase, were due to cars leaving the garage. These 627 cars in the nine-hour period were equivalent to 81% of the garage capacity.

Although the departure of vehicles from the garage was negligible until 1:00 P.M., the nine-hour average of cars leaving the garage was 34.8 per half hour. The average for the 5-hour period from 1:00 P.M. to 6:00 P.M., when the flow of vehicles from the garage increased, was 60.8 vehicles per half hour.

The previous 9 hour flow of northbound vehicles on this street was 175 cars per half hour before the operation of the garage. On the 125-foot section of Riverside Drive between the garage and the intersection with West Town Street, the "after" study showed an average of 221 vehicles per half hour or an average increase of 26% per half hour. South of the exit, the average increased to 186.5 per half hour. Part of this increased traffic south of the exit during certain periods was due to the inability of the garage reservoir to accommodate the parking demand and resulted in vehicles cruising around the block, as will be described later.

During the period from 4:00 P.M. to 4:30 P.M. when the peak number of 103 vehicles were leaving the facility, or the equivalent of 13.3% of the garage capacity, the volume of traffic on the street north of the exit was 359 vehicles. The peak number of departing vehicles, therefore, contributed to 28.6% of the street traffic.

The maximum of 394 vehicles on the street north of the exit occurred between 5:00 P.M. and 5:30 P.M. During this interval, 79 cars or 10.2% of the garage capacity, entered the street traffic flow. These 79 vehicles amounted to 20% of the northbound traffic on the street.

The net change in the volume of northbound traffic both north and south of the exit is graphically shown in Figure 4. It is interesting to note that with an average increase of 46 vehicles per half hour on the street, there was an average of 34.8 cars per half hour, or 4.5% of the garage capacity, leaving the garage. In other words, an average of 4.5% of the garage capacity leaving the garage per half hour was equivalent to 75% of the average increase in the street traffic.

The peak increase in traffic on the street north of the exit occurred in the half hour interval between 3:00 P.M. and 3:30 P.M. when an increase of 139 vehicles approached the intersection of Riverside Drive and West Town Street. This represents an increase of 69% in the volume of traffic. During this same half hour period, 76 vehicles or 9.8% of the garage capacity, left the garage and joined the traffic stream. These 76 vehicles amounted to 54.7% of the increased street traffic.

On the basis of these observations, the percent of increase in the street traffic between the "before" and "after" studies, which was due to the garage, varied from 54.7% when there was peak increase in street traffic, to 95.3% when the peak number of vehicles were leaving the facility.

Effect of Garage Reservoir Capacity and Rate of Parking Vehicles Upon Street Traffic

One of the most common deficiencies to be found in present day off-street parking facilities is lack of sufficient reservoir space. Inadequate reservoir space not only limits the operation of the garage but also turns away customers.

The size of a parking garage reservoir should be the differential between the average rate at which the vehicles can be stored and the rate at which the customers may arrive. If the rate at which the attendants can park the incoming cars is satisfactory to meet only the average demand on the garage, then the reservoir must be sufficiently large to absorb the peak demand.

The Parking Manual of the American Automobile Association reports that the average reservoir space of 50 garages was equivalent to 7.6 spaces per 100 car capacity. Based on this average, the Lazarus Garage, with a capacity of 772 cars should have a reservoir capable of accommodating 58 vehicles instead of 25.

As previously mentioned, the rate of arrival of the garage patrons during periods of peak demand exceeded the rate at which the attendants were able to store the vehicles. This resulted in the accumulation of waiting vehicles completely filling the reservoir and backing onto the street where they blocked the flow of through traffic (Figure 3).

on the street approach to the garage entrance. During the nine-hour period of the study on December 19, an average of 48.3% of the traffic on Ludlow Street entered the garage.

On the short section of Ludlow Street extending from the garage entrance a distance of 70 feet to the intersection with Town Street there was an increase of 781 vehicles during the nine-hour period after the garage was in operation (Figure 2). This is an increase of 72% over the previous volume of traffic and was entirely due to the demand for parking. Prior to the operation of the garage there was an average of 60 vehicles per half hour for the nine-hour period on this street. With the garage in operation, the demand for parking increased this average to 103 vehicles per half hour with an average of 50 vehicles per half hour entering the facility. This average of 103 vehicles per half hour was maintained despite the fact that during the first hour and a half of the study there was a 19% decrease in the volume of traffic on this street due to the retail stores not opening until 12:30 P.M.

During the peak half hour period from 1:00 P.M. to 1:30 P.M. there were 171 vehicles on this section of street of which 139, or 81.7%, of the vehicles entered the garage. This volume of entering traffic was equivalent to 18% of the garage capacity.

The average increase of 43 vehicles, or 72%, per half hour in advance of the garage entrance was the equivalent of 5.5% of the garage capacity. During the peak half hour period from 1:00 P.M. to 1:30 P.M., the net increase in the volume of traffic on the street amounted to 126 vehicles, or an increase of 280% over the previous volume of traffic in the same period. This peak half hour increase of 126 vehicles was equal to 16.3% of the garage capacity. In other words, during the peak half hour period, when 18% of the garage capacity entered the garage, there was a corresponding increase of 280% in the street traffic, or the equivalent of 16.3% of the capacity of the garage, and 100% of this increased traffic on the street entered the garage.

Beyond the garage entrance there was an average decrease in the volume of traffic of —6.7 cars per half hour or an 11% decrease. As noted in Figure 2, there was a total of 121 less vehicles beyond the garage entrance during the nine-hour period of the December 19th study. This decrease in traffic may be attributed to the following reasons:

1. Vehicles that formerly traversed the street in search of a parking space, patronized the garage after it was in operation.
2. Vehicles that were formerly in the habit of using the street were driven away by the increased congestion and delay encountered at the intersection of Ludlow Street and West Town Street.

Effect of Parking Demand on Left Turning Movement Leading to Garage

The critical point of traffic movements occur at the intersections. Increased left turning movements result in additional conflicts between opposing streams of traffic, thereby adding to the existing street congestion and delay. The relative increase in the volume of left and right turning movements at the intersection of Ludlow Street and West Town Street is shown in Figure 2. The average number of left turns before the operation of the garage was 24.5 per half hour. The average number of left turns after the garage was open was also modified by the delay in opening the retail stores until 12:30 P.M. Between the hours of 9:00 A.M. and 12:00 P.M. there were 29% less than the previous number in that period. However, the overall average number of left turns for the 9-hour period of the "after" study increased to 39.2 per half hour or an increase of 60%.

The peak 30 minute volume of left turns occurred from 1:30 to 2:00 P.M. when 79 vehicles turned into Ludlow Street. When this number is compared with the "before" total of 34 left turns for the same half hour period it represents an increase of 132%.

During the 9-hour period there was an average increase of 14.6 left turns, or 60%, per half hour which was equivalent to 1.9% of the garage capacity. The peak net increase in left turns occurred during the half hour period from 1:00 P.M. to 1:30 P.M. and amounted to 54 vehicles or an increase of 300% over the "before" number. This peak half hour increase was equivalent to 7% of the garage capacity.

Fig. 3
View of garage reservoir filled to capacity and vehicles backed into street

It is necessary that a parking facility provide rapid handling of the incoming cars if these vehicles are to avoid causing traffic delays on the street. During the periods of peak demand on the Lazarus Garage, the incoming patrons arrived faster than the attendants were able to park the vehicles. As a result the accumulation of waiting vehicles backed up into the street the distance of 70 feet to the intersection where the left-turning vehicles halted the through movement of traffic on West Town Street. This condition is depicted in Figure 3.

Effect of Parking Demand on Right Turning Movements Leading to Garage

A similar increase was noted in the number of vehicles turning right into Ludlow Street. The previous average number of right turning movements before the garage was opened amounted to 35 per half hour for the nine-hour period. This number increased to 65 per half hour after the garage was in operation, or an increase of 82%.

traffic. A majority of the garage customers coming from the eastern and southern part of the city as well as from the business district, use this street.

The garage exit is on the opposite side of the structure from the entrance and fronts on Riverside Drive which flanks the east bank of the Scioto River. Riverside Drive is one of the principal arteries leading to the northern part of the city and terminates a short distance south of the garage. It carires a heavy volume of traffic as it provides a means of by-passing the business district located two blocks to the east.

Method of Study

Prior to the completion of the garage, a volume count was made, from 9 A.M. to 6 P.M. on Friday, November 7, 1947, of all traffic entering the intersection of West Town Street and Riverside Drive, as well as the intersection of West Town Street and Ludlow Street. This volume count was taken in 5-minute periods in order to detect the slightest fluctuation in the characteristic traffic flow of the area and more readily relate this flow to the number of vehicles entering and leaving the garage during the "after" study.

Approximately four weeks after the garage was in operation, a similar count was taken from 9 A.M. to 6 P.M. on Friday, December 19, 1947. In addition, a count was made of all vehicles entering and leaving the garage during each 5-minute period. Unfortunately, at the time of the second volume count, since it was one week before Christmas, the downtown retail stores did not open until 12:30 P.M. although the garage was in operation 24 hours a day. As a result, the period of greatest demand on the garage occurred from 12 to 1:30 P.M. It was realized that since the count was taken so near to Christmas, it resulted in an abnormally large demand on the garage for shopper parking. Therefore, all results of the study, as related to the generated traffic on the streets, would be due to an unusually heavy concentrated demand for parking in the garage and not necessarily be representative of a normal business day. However, this adverse effect may be offset in some measure by the fact that since the garage had just recently opened many people had not yet adopted the regular custom of using the facility, otherwise the peak loads might have been even heavier due to the addition of the occasional customers to the regular type of patron.

During the second volume count a No Left Turn standard was erected by the Police Department at the intersection of West Town Street and Riverside Drive between the hours of 3:05 P.M. and 5:25 P.M. This restriction affected the normal traffic pattern at this intersection, resulting in the total left turning movement for the 9-hour period being less than in the previous study.

Generated Traffic Due To Parking Demand

During the 9-hour period of the study before the garage was in operation the total traffic entering the combined intersections amounted to 14,277 vehicles. During the same period of time after the garage was in operation, a total of 16,053 vehicles entered the area. This represents an increase of 1776 vehicles, or 12.4%, in the total traffic entering and leaving the combined intersections. Of this increase in traffic, 902 vehicles entered the garage and 713 departed during the nine-hour period, for a total 1615 vehicles. Thus the increase in traffic flow directly attributed to the demand for parking was equivalent to 91% of the total increase in the volume of traffic on the streets.

The comparative change in the volume of traffic at the two intersections is graphically shown in Figure 2. As previously mentioned, the erection of the No Left Turn standard at the intersection of West Town Street and Riverside Drive resulted in a decrease in the total number of left turns during the period of the second study. On Riverside Drive, south of the intersection with West Town Street, there was an increase of 300 vehicles in the southbound traffic which was in no respect due to the garage. However, in the "before" study, during the period from 4:00 P.M. to 5:30 P.M. a total of 232 vehicles approaching the intersection from the north on Riverside Drive, turned left into Town Street. If during the "after" study, approximately the same number of vehicles were prevented from making this turning movement and continued straight across the intersection, they may possibly have contributed to this increase.

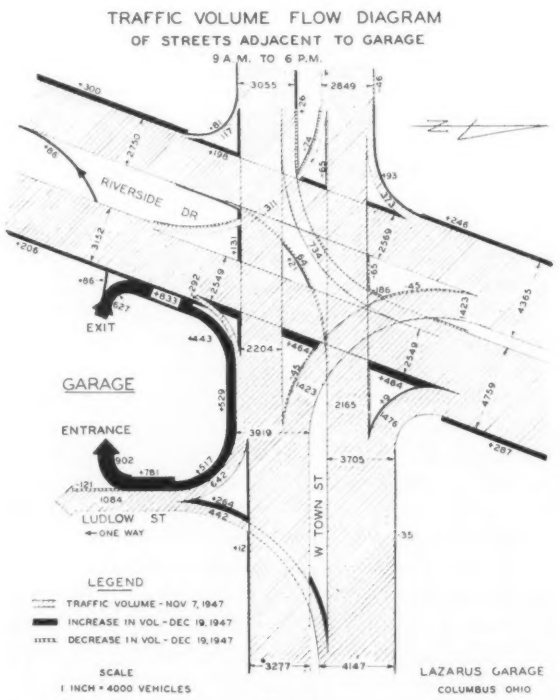


Fig. 2

Effect of Generated Demand on Street Approach to Garage Entrance

The traffic which was due to the demand for parking was found to represent an increase of 11.3% in the volume of traffic on the streets. Attention is now directed to the effect of this parking demand upon the volume of traffic

The Effect of An Off-Street Parking Garage As a Traffic Generator

By WILLARD H. ARMSTRONG (Assoc. Mem., ITE)
Asst. Traffic Engineer, Ohio Department of Highways

THE IDEAL location for an off-street parking facility is as close as economically possible to the area of greatest deficiency of parking space with relation to the demand. It is equally important that it be situated close to the routes of travel of the prospective parkers whom it is to serve in order to avoid excess travel. However, in determining the location of a parking facility, consideration should not only be given to the problem of establishing adequate off-street storage but also to maintaining the increased traffic flow on the adjacent streets due to the use of that facility. The location of the terminal, the convenience of parking and the efficiency with which the facility is operated can readily modify the traffic pattern on adjacent streets. If consideration of the flow of vehicles to and from the proposed facility is neglected in determining its location, the facility will not be effective in reducing the congestion in the business district. This congestion on the adjacent streets due to the operation of a parking garage may readily occur in the following ways:

1. The capacity of the adjacent streets may be partly taken up by the movement of vehicles to and from the garage.
2. The normal flow of traffic may be interrupted by vehicles entering and leaving the facility.
3. The location of the entrances and exits of the facility with respect to the predominant origins and destinations of the parkers may result in increased turning movements on the approaches to the garage.
4. Insufficient reservoir space to accommodate entering vehicles during periods of peak demand may result in the accumulated cars backing up into the street.

An opportunity to study the effect of the operation of a large parking garage upon the traffic flow on the adjacent streets presented itself with the construction of a four-story, open-deck parking garage owned and operated by the F. & R. Lazarus Department Store in Columbus, Ohio. By making a traffic volume count on the adjacent streets before the garage was in operation and a similar count after the garage was functioning, together with a count of the number of vehicles entering and leaving the garage during the period, it was possible to obtain some measure of the influence of this parking facility on street traffic.

The Lazarus Parking Garage

The location of this garage as a parking terminal is nearly ideal, since it is situated only two blocks from the principal street in Columbus and one block from the Lazarus Department Store. At the same time, due to its location on Riverside Drive, which parallels the Scioto River through what is known as the Civic Center of Columbus, the garage may be considered as being on the fringe of the business district. This proximity to the downtown stores and business district makes it very convenient for both shopper and business parking. It is constructed on a triangular site covering an area of 55,000 square feet and abutting on three streets as shown in Figure 1. The garage has a capacity of 772 vehicles with a parking area of 249,565 square feet. The rate structure, which would no doubt appeal to the long-time parker, is based on a charge of 25 cents for the first hour and 5 cents for each additional hour.

Fig. 1
View of garage looking south on Riverside Drive

The garage is an open-deck type of structure built of reinforced concrete and consists of three tiers of parking decks connected by a d'Humy type of ramp system so that the front and rear portions are staggered, thus making each successive level a half story above the other.

The entrance to the garage is situated on Ludlow Street which is a short one-way street southbound from West Town Street and normally carries a very minor flow of traffic. Four entrance lanes, located 70 feet from West Town Street, admit the vehicles into a reservoir space with a capacity of 25 cars, where they are turned over to attendants for parking. West Town Street, which bounds the garage on the north, is one of the major east and west arteries of the city and carries a relatively high flow of

problem—not alone to his prime responsibility.

In one city surveyed, it was learned that an extensive program for relighting the downtown section was well beyond the early planning stages. The plan was going to cost nearly one-quarter million dollars. "Have you given any consideration to the relation of the new lighting standards and the very badly needed relocation of your downtown traffic signals?" a division head was asked. He replied that the poles were *heavy* enough to support the signals! There was no appreciation of the simple fact that that the new signals would influence precise location much more than the luminaires for which the poles were primarily designed. The extra effort to locate signals that could be seen by vehicles and pedestrians would easily be paid for by reduced accidents within a year of the first throw of the new switch.

Other examples of lack of appreciation for traffic values were found in the Department of Public Works, the City Engineer's office, the City Planning Department, the Street Cleaning Department, the Corporations Councils' office, the Utilities Department, the Board of Education.

(4) The Police Department of cities are blamed for too many of the town's traffic ills.

Over the years, the law enforcement agencies have been going about their business of curbing criminals with the public generally satisfied with the operation. Then the sudden passage of the flood of traffic laws, coincident with the upsurge of private ownership of motor vehicles some 30 years ago, put the police department in the city planning and public relations business. The new laws made everybody criminals at some time or other. The years went on with the public feeling that traffic service from the municipality was all a police matter. This citizen conception is gradually being changed, but other city departments won't "lean over backwards" to fulfill their traffic responsibilities until the public holds them responsible.

As an example of this tendency to blame the police for everything unpleasant in traffic, the Association city survey activities showed a general belief that the downtown parking problem would only be improved when the police "got to work" and arrested everybody who parked more than one hour downtown. Some cities wanted blanket 20 *minute* regulations enforced rigidly.

A basic mistake in city planning and in business policy —not forseeing the present demands of individual auto ownership is blaming the police. The police are properly reluctant to become a part of the thinking which goes like this—"since we have only 1000 parking spaces downtown and 1500 cars wanting to use them, let's have the police *fine* everyone five dollars if they stay downtown too long!"

The apprehension of speeders with murderous disregard for life and property seems more of a police function, but it is more basic to blame the school system which releases young drivers with no preparation for an activity which is such a large part of being a good citizen.

(5) The formation of Traffic Committees*, either officially set up by city ordinance or a citizen advisory group, is no assurance of a good traffic program.

It is recognized—or it appears that we are in the process of recognizing—that the "standard" recommendation of forming a traffic committee is not going to automatically furnish the coordination and public enthusiasm necessary to "spark" the traffic program. The Association's city survey work disclosed (a) that ordinances creating Traffic Committees in some cities not having otherwise good city administration was merely of "paper" value, (b) that the personalities on the Committee were more important than the fact of the Committee's existence, (c) that Traffic Committees generally fail in not advising *all city departments* in matters concerning traffic. The Committee may bicker for hours about the height of a hedge at a corner and completely ignore basically bad practices in the everyday operation of the police department, the traffic courts, or the department of public works, (d) that the effectiveness of the Committee—notwithstanding the health of the general city government or the quality or interest of the members—is as effective as its public relations program. In our democratic cities, the officials, from the department head to the top men, are necessarily always a little behind public opinion. The Committee must generate a desire for a specific improvement before the chief executive and the council will take official action!

In some cities, even where the Committee is composed of citizens only, the public respect for the work of the Committee is so high and the timing with respect to public acceptance so good, that the "advice" of the group is almost accepted as an order. In other cities the Committee's scientific deliberations of intricate problems of coordination are brushed aside at council sessions in the heat of public interest in other matters.

(6) Strong community leadership in traffic safety by some organization is necessary.

In the cities surveyed by the Association, it was obvious that the majority of leading citizens and almost all organizations were "anxious to do something about traffic". It was equally obvious that each organization—including the insurance groups—were wandering around expending energy looking for a program. What they really were looking for was *leadership!* When given something specific to promote, the organization immediately came to life.

(See CITY TRAFFIC, *page 167)*

* An official Traffic Committee is composed of the department heads concerned with traffic such as the police chief, the city engineer, the traffic engineer, the court judge, the city planner. Some committees also include citizen representatives of organizations. The committees generally are advisory to the department and the council and chief executive.

City Traffic Administration

By J. A. CARROTHERS (Assoc. Mem., ITE)
Traffic Engineer, City of Schenectady, New York

THERE IS NO laboratory in which to study city traffic problems other than in the cities themselves. There are no guinea pigs or small scale models that simulate the complex operation of the thousands of miles of streets which hold our cities together. There are no pilot plants to point out the requirements of good traffic administration. Recognizing this, the Accident Prevention Department of the Association of Casualty & Surety Companies, some years ago added the item "city traffic surveys" to the program of its traffic engineering section. Prior to the author's recent appointment to the City of Schenectady, he was directly concerned with the operation of this program.

Nine cities were surveyed: Parkersburg, West Virginia; Morristown, New Jersey; Westport, Connecticut; Elgin, Illinois; Williamsport, Pennsylvania; Peoria, Illinois; Cincinnati, Ohio; Joplin, Missouri; and Great Neck Plaza, Long Island.

Limited studies of specific problems were also conducted in Garden City, New York; Boonton, New Jersey; Bergen County, New Jersey; Omaha, Nebraska; Poughkeepsie, New York, and Bronxville, New York. Recently completed are studies in five cities of the Mohawk Valley in New York State—Utica, Rome, Amsterdam, Little Falls, and Herkimer.

A stock-taking of the city survey work shows some answers to the question, "What's wrong with traffic in our cities?" The following paragraphs present the *answers* in the shape of *principles* to guide future action:

(1) Whether it is pleasant or not, it must be admitted that a city traffic program is a matter of "politics".

A sad matter indeed is the plight of well-meaning police traffic divisions and of traffic engineers, whose talent is hopelessly wasted due to the morale-shattering fact that traffic controls are installed on the basis of aldermanic strength. In one city surveyed, it was evident that over 50% of the stop signs in towns were unwarranted! Each had been installed by vote of the full Board of Aldermen. Investigation showed that it had been the practice for aldermen to agree to vote for signs at a given intersection in any ward if another alderman would vote for similar signs in his.

The Association studies included cities having the town meeting, the "double-house" of ward-elected council and aldermanic board, the commission form, the strong mayor form, and the city manager form. The basic form of government was found to be a most important factor in good traffic administration as it is in other city problems. *The performance record of city government in traffic checked closely with studies of governmental research groups interested in other matters.*

It was clear that the basic principle of good city administration—that the responsibility for each phase of government be clearly fixed and obvious to all—also applied to the traffic program. In cities having the clear-cut lines of authority characteristic of the strong-mayor form or the manager-council form, the job was either accomplished well within the funds available—or it was clear who was falling down on the job.

(2) The "top man" must be "sold" that traffic responsibility is an important municipal function.

If the mayor or city chief executive has either a strong hand by charter or by force of personality, it is most difficult to push through measures for better and safer traffic if he is not "traffic minded". A municipal bus company manager in an eastern city said, "We are getting new equipment and efficient operation now for only one reason—the mayor is our first in 15 years who has been transportation conscious".

In one city surveyed, the mayor said, "I believe I was elected because I promised to do something about our traffic problem". On being phoned very shortly after the Association survey report was presented, this same mayor, when questioned about action his Traffic Committee had taken, said, "Do you hear that rumble in the background—that's a bulldozer leveling the new parking area you recommended in your report". It was only a scant two weeks after the report was presented!

In one city surveyed, the mayor said, "I'll see that our council committee studies this matter". They are still studying it!

(3) Since traffic is a municipal service rendered in part by almost every department in the city, there must be definite interest on the part of each division head and a high degree of coordination between divisions.

The responsibility for coordinating city department operations properly falls on the elected chief executive, but each department head must be "sold" that all phases of his work must be assayed in its relation to the traffic

the feelings of the merchants? Wouldn't local merchants point out the possibility that these officials were prejudiced and were not giving the correct data? It was evident that we would have to clear up this point to the satisfaction of all. The second phase of this study was undertaken. Postal card questionnaires were forwarded to Chambers of Commerce of 90 cities with the request that these be forwarded to the president of the merchants association whose members were most affected by one-way streets in their city. These merchants associations were requested to obtain the consensus of opinion of their members regarding the following questions:

Question 1—Are you for, against, or neutral to one-way streets?

Question 2—Have they had permanent, harmful effects on adjacent business?

Question 3—Are the over-all benefits of the one-way street plan sufficient to receive your favorable recommendations?

Question 4—Is the one-way street plan popular with the general public?

Again we were fortunate in receiving a high percentage return of answers from merchants associations from all sections of the nation. Seventy-three per cent of the cities returned questionnaire cards. Complete information was contained on 50 of the returned cards. The results are illustrated in Fig. 3.

The returns from the second phase of this study completely cleared any doubt we may have had regarding the attitude of merchants towards one-way streets. Summarizing briefly each question in turn we find:

Question 1—Merchants are definitely for one-way streets *after such installations have proven their value.* The consensus of opinion of the members of 80 per cent of the organizations reporting prove this point. Only 10 per cent were against one-way streets.

Question 2—One-way streets do not have permanent, harmful effects on adjacent business. Eighty (80) per cent of the merchants associations believe this to be true. Only 4 per cent believe one-way streets to be partially harmful.

Question 3—Of exceptional interest is the fact that 83 per cent of the organizations would recommend one-way street traffic control to other cities on the basis of its overall benefits.

Question 4—The popularity of one-way streets with the general public is indicated by an 82 per cent opinion that this is so.

The pride and enthusiasm of a number of reporting cities for their one-way street plan is demonstrated by their desire to furnish additional facts which have developed from their experiences with one-way traffic control. Some of their comments are very enlightening:

Fort Wayne, Indiana—"Surveys made before and after the installation went into effect indicated 50 per cent more traffic handled at stepped-up speeds, with fewer accidents. Increased traffic volumes traveled at speeds as much as 75 per cent higher than was possible on two-way streets. Delay periods were cut as much as 86 per cent and accidents were reduced 10 per cent during a 10 month period. General opinion of retailers is that new system had caused no harm to business but had contributed greatly in alleviating our traffic congestion problem".

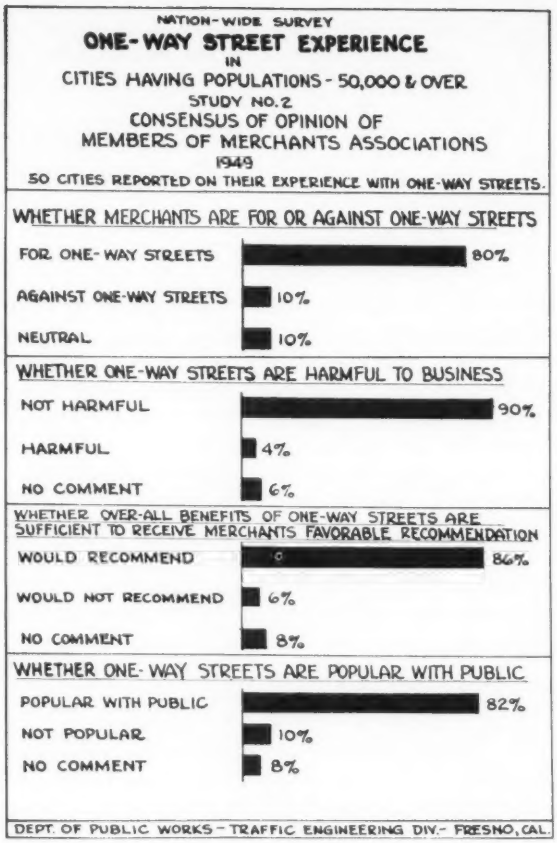

NATION-WIDE SURVEY
ONE-WAY STREET EXPERIENCE
IN
CITIES HAVING POPULATIONS - 50,000 & OVER
STUDY NO. 2
CONSENSUS OF OPINION OF
MEMBERS OF MERCHANTS ASSOCIATIONS
1949
50 CITIES REPORTED ON THEIR EXPERIENCE WITH ONE-WAY STREETS.
WHETHER MERCHANTS ARE FOR OR AGAINST ONE-WAY STREETS
FOR ONE-WAY STREETS 80%
AGAINST ONE-WAY STREETS 10%
NEUTRAL 10%
WHETHER ONE-WAY STREETS ARE HARMFUL TO BUSINESS
NOT HARMFUL 90%
HARMFUL 4%
NO COMMENT 6%
WHETHER OVER-ALL BENEFITS OF ONE-WAY STREETS ARE SUFFICIENT TO RECEIVE MERCHANTS FAVORABLE RECOMMENDATION
WOULD RECOMMEND 86%
WOULD NOT RECOMMEND 6%
NO COMMENT 8%
WHETHER ONE-WAY STREETS ARE POPULAR WITH PUBLIC
POPULAR WITH PUBLIC 82%
NOT POPULAR 10%
NO COMMENT 8%
DEPT. OF PUBLIC WORKS - TRAFFIC ENGINEERING DIV. - FRESNO, CAL.

Fig. 3

Providence, R. I.—"One-way streets have not been harmful to business but have eased up traffic flow in the downtown area. This has encouraged people to come into the area to shop".

Clifton, N. J.—"Invariably there is considerable protest immediately after inauguration of such plans but these objections stop as soon as the public realizes the tremendous benefits of one-way thoroughfares, where needed, and eventually comes to enjoy the wholesome results".

Winston-Salem, N. C.—"Our membership (merchants associations) is highly enthusiastic over the results of our one-way planning".

Los Angeles, Calif.—"Cordon counts taken since the institution of these one-way streets has shown that, on an average, 30 per cent more traffic is being handled by this pair of one-way streets".

New Rochelle, N. Y.—"The volume of traffic on one-way streets has increased approximately 30 per cent. Speed of traffic has increased slightly, however, travel time has been reduced considerably due to reduction in congestion.

(*See* ONE-WAY STREET, *page 167*)

Question 6—What was the final reaction of merchants, residents, motorists, transit, truckers, or others towards one-way streets? For them or opposed to them?

The return on the questionnaire cards was highly gratifying. Within a period of one month, 66 per cent of the answers had been received furnishing us with the information desired. It was found that the data contained in 56 replies could be used as the experience of cities having a real one-way plan. The remainder were discarded because the scattered nature or the shortness of the one-way streets did not give the desired experience. A number of cities cooperated even further by submitting letters which gave additional valuable and interesting experiences. A summary of the data received is effectively illustrated in Figures 1 and 2.

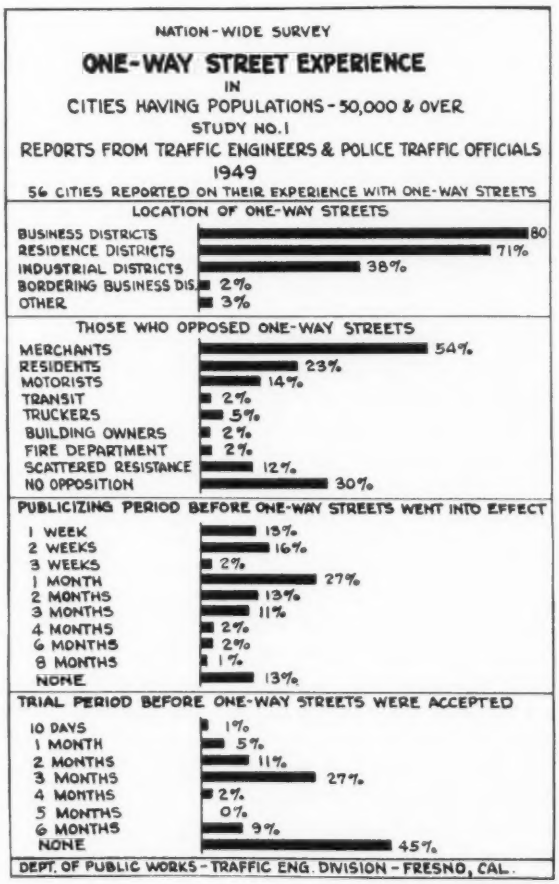


Fig. 1

A review of the initial survey reveals the following interesting and pertinent facts regarding the experiences of these cities:

Question 1—One-way streets are found predominantly in residential and business districts.

Question 2—Merchants are the chief opponents of any one-way street plan as reported by 54% of the cities. Thirty per cent of the cities inaugurated one-way plans with no opposition.

Question 3—One to three months advance publicity is desirable for a one-way plan as indicated by 51 per cent of the cities reporting.

Question 4—No trial period was necessary for 45 per cent of the cities reporting, but should one be necessary, 3 months is considered the most desirable by 27 per cent of the cities.

Question 5—Traffic engineers and police traffic officers were unanimous in declaring their one-way street plans successful.

Question 6—One-way streets are benficial to property owners and business concerns as reported by 71 per cent of the cities. Only 5 per cent reported the systems partially harmful.

Question 7—Of extreme interest is the fact that the

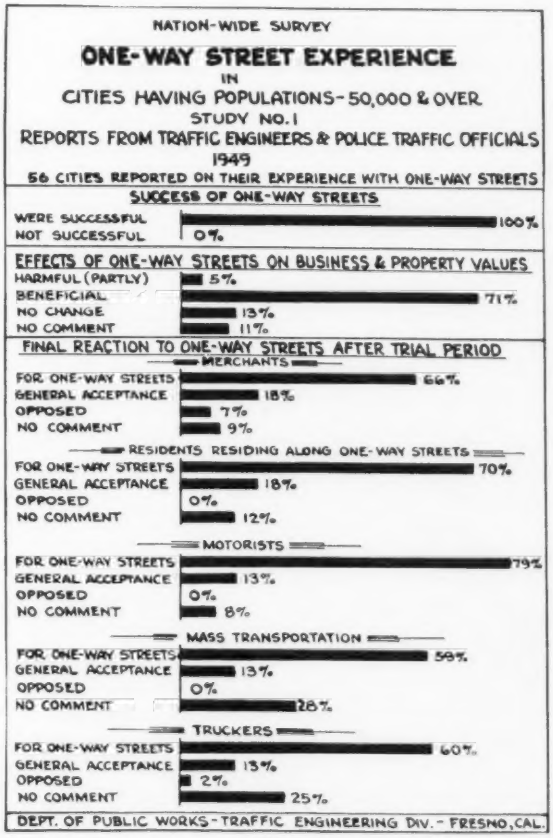


Fig. 2

merchants who are the chief opponents of the one-way plan were reported to be for the plan in 66 per cent of the cities *after a trial period*. All other groups are reported to have a high regard for one-way streets.

Phase "Two" of Questionnaire Survey

The surprising reversal of the attitude of merchants towards one-way streets as reported by traffic engineers and police traffic officials, planted the seed of doubt in our minds. Did these officials have a true perspective of

One-Way Street Experience of Cities

By ROBERT D. DIER (Mem., ITE)
City Traffic Engineer, Fresno, California

IS YOUR CITY one of those typical American communities whose central business district is composed of inadequate sized blocks bounded by a rectangular grid system of narrow streets? Is your city desparately in need of a solution to the traffic congestion and accident problem created by the ever increasing vehicular traffic on your narrow streets? If these conditions exist in your community, do not despair, because a possible solution to your problems does exist.

There is a proven plan of traffic control for such cities, inexpensive to install and very effective towards producing the desired results. This plan is commonly referred to as *the one-way street plan* of traffic control. There is evidence that fifty per cent of the 239 cities in this nation having populations of 50,000 or over are not enjoying the accident and congestion reduction benefits of this plan. Only a small percentage of these 239 cities have gone so far as to install a complete one-way street system in their central business districts. It is entirely possible that hundreds of cities under 50,000 population could use this plan as a solution to their traffic problems.

Why isn't the one-way plan of traffic control used more extensively by cities if it is so effective as a means of alleviating the traffic congestion and accident problem? One logical reason is that certain cities do not have the "grid" type of street pattern required for most effective one-way operation. Another reason, in rare instances, is that the early planners of certain cities were farsighted enough to provide street widths and block design adequate for the two-way movement of the large present day volumes of vehicular traffic. The more plausible reason, however, is that many cities are not aware of the numerous advantages of the one-way street plan, nor are they informed as to the extent of the success of one-way street operation in the more progressive cities that have pioneered in one-way street traffic control. There is no excuse for cities not being informed on the advantages of the one-way plan because it has been publicized for many years in leading periodicals throughout the nation.* Perhaps they have not been informed on the over-all experience of cities using one-way street control. This experience has been publicized from time to time in piece-meal fashion, and evidently has not been strong enough to convince cities of the desirability of one-way streets. There still remains considerable doubt in the minds of many as to whether such a plan would be successful in their communities. Successful one-way systems in other cities are often looked upon as special cases—not necessarily an indication that they would be desirable in the home community.

* A recent example is the article "Facilitating Traffic Flow With One-Way Streets", appearing in the October, 1949 issue of TRAFFIC ENGINEERING.

Nationwide Survey Undertaken

The City of Fresno (pop. 90,000), similar to many cities throughout the nation, has inherited a street system in its central business district of the grid-type pattern, having widths and block lengths which are inadequate to serve two-way traffic movements under present and future traffic conditions. Traffic volumes have approximately doubled on these streets in the past two years, maintaining pace with the rapid growth of the city. Even in the past, traffic conditions have been such that there has been a trend of thinking towards one-way streets on the part of the more visionary citizens of this community. This thinking was the result of reading of the experience of other cities, or resulted from favorable reports by travelers who had witnessed one-way street operation in other municipalities. In spite of their favorable attitude there still remain a number of questions which must be answered before the one-way plan will receive the unanimous support of the citizens of this community. These answers, to be impressive, must be based on facts obtained, not from the experiences of a few cities, but from a nationwide experience covering all sizes of cities and conditions.

The City of Fresno undertook a nationwide study for the purpose of obtaining the one-way street experience of as many cities as possible in every section of the country. The statistical department of the National Safety Council cooperated by furnishing a list of cities of 50,000 or more population who had reported one-way streets in operation in connection with their National Safety Contest report. It was decided to use the simple, self-addressed, penny postal card type of questionnaire in order not to discourage replys. These postal cards, containing the following questions, were mailed in separate envelopes to traffic engineers and police traffic officials in 100 cities:

Phase "One" of Questionnaire Survey

Question 1—Are one-way streets located in business, residential, industrial, or other districts?

Question 2—Who resisted the one-way street plan—Merchants, Residents, Motorists, Transit, Truckers, or Others?

Question 3—How long was the publicized period, the trial period?

Question 4—Was the one-way system successful, not successful?

Question 5—Was there evidence of property owners and business concerns being (1) harmed, or (2) benefited by one-way streets?

Off-Street Parking News Round-up

By LeVERNE JOHNSON (Assoc. Mem., ITE)
Traffic Engineer, American Automobile Association
Washington, D. C.

OFF-STREET Parking News Round-Up attained some popularity as an annual feature during the past couple of years. It is hoped that it will gain in popularity and usefulness to such an extent that ITE members and others will use it as a medium for reporting progress in parking.

The following summarized list of 37 cities reporting is by no means exhaustive. Any corrections or additions of other cities which readers may know about will be appreciated.

BERKELEY, CALIFORNIA (Pop. 85,000)

An origin-destination study and other parking use data are being completed, all to be coordinated with studies of other cities in the East Bay area. (Reported by Richard Gallagher, Director of Public Works)

SACRAMENTO, CALIFORNIA (Pop. 106,000)

In the November 1948 election, voters approved a charter amendment which authorized the city to acquire property for, construct, and operate off-street vehicular parking facilities. Financing will be provided by revenue bonds plus an allocation of $50,000 or 25 per cent of the parking meter revenue.

The city planning commission is in the final stages of preparing a report which will recommend that the city acquire about 3,000 off-street parking spaces under the provisions of the new charter amendment. A number of sites are being considered and appraisals being made for an initial increment of 1,400 off-street parking spaces.(Reported by D. J. Faustman, Traffic Engineer)

DENVER, COLORADO (Pop. 322,000)

In 1948 the people of Denver voted a 4½ million dollar bond issue to be used for the purpose of purchasing property and constructing ramps for off-street parking purposes. Shortly after the money was voted, the Mayor appointed an off-street parking committee consisting of lay members who are charged with the responsibility of selecting sites, employing architects to design ramps, deciding who is to operate the facilities, the city or private enterprise, and rates to be charged. The committee was established by city ordinance and $50,000 was allocated for initial engineering services. All plans prepared by the committee are to be referred to the City Planner and Traffic Engineer before they are adopted for construction.

To date no sites have been selected, but it is anticipated that within a short time recommendations will be made to the Mayor and Council for the purchase of at least four sites within the central business district. A decision will be made after the sites are selected as to whether or not there will be surface lots or ramp facilities.

Out of the 4½ million dollars voted for this project, 4 million dollars is to be used in the central business district and the other half million dollars to be used in the outlying districts. (Reported by Henry A. Barnes, Director, Traffic Engineering Section)

GREENWICH, CONNECTICUT (Pop. 35,000)

Back as far as 1928, it became evident that off-street parking facilities would be necessary to relieve traffic congestion. Other studies were made throughout the years resulting finally in the Parking Act of 1941. A local ordinance establishing necessary legal machinery for action was approved by a referendum later the same year. Surveys began in 1944 and tentative plans, including cost estimates, were prepared in 1945. In 1947 new zoning regulations were adopted calling for off-street parking in connection with certain land uses.

A new parking act was passed in 1949. The essential difference between the old and new is: Under the old act the Town must pay for all improvements and, if Town Meeting so voted, part of the cost of acquisition of property; under the new act the benefited properties must pay all costs of land acquisition and may have to pay a portion of the improvements if Town Meeting so votes.

The probabilities are the financing will be done largely by special benefit assessments and some portion of the improvement costs by direct taxation. The probabilities are that bond issues will not be involved, although the Town has the authority to issue bonds if the Finance Board believes this procedure wise.

No parking authority is specifically so designated. However, the Selectmen, through the Commissioner of Public Works, for all practical purposes will act as a parking authority.

The parking facilities will be owned and operated by the municipality. It is doubtful if they will ever be leased to private operators. (Reported by Joseph W. Cone, Commissioner, Department of Public Works)

HARTFORD, CONNECTICUT (Pop. 166,000)

A little over two years ago, the city, in cooperation with a committee of downtown merchants, established what is known as the Armory Parking Lot. It is a peripheral lot located about a mile from the downtown area. There is a shuttle bus and, while the bus does not pay for itself, the lot does. The parking charge for all day is 5c. Lot capacity is 700 vehicles. The land it is situated on belongs to the State and is loaned, rent free, to the city for parking purposes. The only cost is that of the attendant, insurance,

heat and light. It operates at capacity about 90 per cent of the time. Most of the parkers are office and factory workers. By parking in the lot it is freeing a number of places that would otherwise be occupied in the downtown area. It is considered an unusually successful operation.

There are many parking lots, but a recent spot check revealed that of 49 lots observed there were 64 instances during a six-day week when parkers were turned away due to the lot being full.

The city is contemplating use of its powers for the acquisition of land for the construction of off-street parking facilities. Everyone is in favor of more parking, except the parking lot operators.

The last legislature allowed a bill authorizing the issuing of revenue bonds for parking facilities to die in committee. (Reported by Charles M. Upham, Jr., Traffic Engineer)

JACKSONVILLE, FLORIDA (Pop. 173,000)

A complete parking study involving some 34,000 interviews with motorists parked at the curb and 6,000 parked in lots and garages is being completed and will probably be released shortly. (Reported by Harry Howard, Jr., Traffic Engineer)

MIAMI, FLORIDA (Pop. 172,000)

During the year 1949, two privately operated parking garages were opened in Miami with a total capacity of 1,210 cars. One is of the enclosed type with four enclosed floors and a roof deck, capable of accommodating 650 cars. The other is of the D'humy Ramp type with the open deck floors in three sections, accommodating a total of 560 cars.

The enclosed garage has semi-circular ramps in one corner and a portion of the cars are parked by the drivers who have specific assignments on a monthly rental basis.

The open deck structure has three center decks staggered between two tiers of four decks each on the sides. All of the decks are cantilevered out over the supporting posts. Ramps go from one level to the next at frequent intervals.

These two garages, together with some recently opened additional privately operated parking lots, have provided some needed relief to the parking problem in the downtown area. Some of the outlying business districts are now working on possible plans for city-operated off-street parking lots with meters, but no arrangements have yet been completed for any of them.

The new open deck garage has received a great deal of publicity in all parts of the country because of its unusual character, including the cantilevered decks. It is understood that one of the large stores in the city has made arrangements with this garage for customer parking, but the details are not complete. (Reported by Earl J. Reeder, Director, Traffic and Transportation)

BURLINGTON, IOWA (Pop. 25,000)

The City of Burlington does not have a parking authority. The City Council is authorized to lease, purchase or sell land for the purpose of off-street parking by the state code of Iowa.

The City Council is authorized to finance these undertakings with a bond issue or a benefited area assessment of ½ mill or charge a parking fee. In 1948, the general assembly of the State of Iowa passed a law that 75 per cent of all parking meter revenue *must* be used for off-street parking.

All off-street parking provided by the City is also controlled by the City. (Reported by Frederick L. Bell, City Traffic Engineer)

WICHITA, KANSAS (Pop. 115,000)

In June 1949, the Board of City Commissioners of Wichita approved an ordinance setting aside 75 per cent of the parking meter income for the financing of off-street parking facilities.

Around the first of September, construction was started on a new six-story parking garage. This garage will have a capacity of approximately 600 cars and is of the open deck type. Plans for another 300-car garage are in the making. (Reported by George J. Fisher, Traffic Engineer)

NEW ORLEANS, LOUISIANA (Pop. 495,000)

The City of New Orleans leases a few city-owned parcels of land on a short-time basis for off-street parking purposes. Leases stipulate maximum charges. (Reported by David F. Dabney, Assistant Traffic Engineer)

BALTIMORE, MARYLAND (Pop. 859,000)

Baltimore created an Off-Street Parking Commission early in 1948. This five-man group, appointed by Mayor Thomas D'Alesandro, Jr., soon discovered that deficiencies in the law under which it was set up so limited its powers that it was unable to function satisfactorily. These deficiencies were remedied during a special session of the Maryland General Assembly in July 1948, and in November of the same year the voters re-approved a $5,000,000 loan to provide the Commission with working capital.

Under the present setup, the Commission is empowered to acquire, either by purchase or condemnation, such property as it deems necessary for provision of parking facilities and to assist private operators in expansion of such facilities. In each instance, however, the private operator must submit a proposal, including detailed plans for the facility to be constructed, and this proposal must be converted into a contract which must, before it becomes effective, be approved by the Board of Estimates of the municipal government.

In each such proposal there must be a reasonable investment by the private operator although the Commission has fixed no definite percentage.

Up to the present time two such contracts have been approved and construction is well under way on one of the projects. This is situated in an area of great deficiency, so far as parking facilities are concerned, and will provide approximately 200 additional spaces. (Reported by G. Harvey Porter, Director, Downtown Committee)

BROOKLINE, MASSACHUSETTS (Pop. 50,000)

Sites for off-street parking have been chosen by the Planning Board and estimates of cost of damages and construction made by the Engineering Department. To date, no program for off-street parking has been adopted

by the Town Meetings. For this reason there is no regular Parking Authority as such. (Reported by Arthur E. Spooner, Assistant Engineer)

NEWTON, MASSACHUSETTS (Pop. 70,000)

The City of Newton does not have a parking authority, although it can, under existing statutes, borrow money or issue bonds to purchase land for off-street parking facilities. Funds for construction of facilities must come from general revenue.

Proposals call for municipal ownership and operation. Under a new statute, it may be possible to use parking meter revenues for off-street parking purposes. While there are no meters at this time, studies are being made for their installation. (Reported by Willard S. Pratt, Director of Public Works)

SPRINGFIELD, MASSACHUSETTS (Pop. 149,000)

Effort at the moment is being directed toward correcting a rather chaotic situation resulting from some 176 parking regulations (relating primarily to curb parking), many of which are conflicting. (Reported by Earl H. Flynn, Traffic Engineer)

DETROIT, MICHIGAN (Pop. 1,623,000)

The trial installation of 1381 parking meters in Detroit's central business district and three outlying business centers in October 1948 has proven successful. The installation of 1612 additional metered spaces in 12 areas has just been completed. 605 more spaces will be metered this year.

The underground garage planned under Washington Boulevard is temporarily shelved because of foundation difficulties in the vicinity of the Statler Hotel and the David Whitney Building. This project will not be undertaken unless these foundation problems can be solved at a cost low enough to make the garage self-supporting.

The Municipal Parking Authority is going ahead with plans for a 780-car capacity structure on Monroe at Randolph Street, as well as plans for off-street facilities in three outlying shopping areas.

In the meantime, three projects are under construction by private operators. Shoppers' Garage, strategically located near large downtown department stores is being enlarged from 250 to 800-car capacity, while a 400-car unit is about completed near the Federal Building. Also a 500-car capacity garage is being constructed in the congested Wayne University area. (Reported by A. F. Malo, City Traffic Engineer)

GRAND RAPIDS, MICHIGAN (Pop. 164,000)

The Grand Rapids Parking Authority now has a plan consisting of the acquisition of four downtown properties and the erection thereon of open side ramp garages. It has also contemplated the building of a parking lot over the east side of Grand River, between the Pearl Street bridge and the abandoned interurban railway bridge. In addition, it has planned to build from four to six parking lots in the outlying shopping centers, and the options for their purchase have now been secured. The latter will be customers parking, and the revenue will be derived by means of parking meters.

The Authority has not yet decided whether the ramp garages will be attendant or customer parking.

This program is to be financed by means of revenue bonds at an approximate value of $2,500,000. (Reported by Jerome D. Franklin, Traffic Engineer)

LANSING, MICHIGAN (Pop. 78,000)

In 1947, the City Council approved an off-street parking plan calling for the development of ten parking lots in the central business district. Five of the lots have been completed. On three of the lots, rates are two hours for 5c, varying up to twelve hours for 30c, and are collected by parking meters. Parking is handled by attendants on the other two lots. Lots having meters are in operation 24 hours per day. Overtime is checked by police.

All five lots were purchased and developed entirely with funds derived from curb parking meter revenues. All income from parking lot meters, as well as curb meters, is earmarked for use in the development of additional off-street parking facilities. (Reported by Sidney A. Anger, City Traffic Engineer)

PORT HURON, MICHIGAN (Pop. 32,000)

The City has no parking authority as such. The City Plan Commission made a study and recommendations for parking facilities in their comprehensive master plan published in 1947. An off-street parking committee, composed of representatives of the City Plan Commission, several city administrative officials and representatives of the retail merchants division of the Chamber of Commerce, has been formed to act as an advisory body in stimulating and expediting progress in securing additional parking facilities.

The City has two municipal off-street parking lots which can hold a total of about 350 vehicles, and leases one parking lot with a capacity of about 110 vehicles.

The City plans to finance the acquisition of additional off-street parking facilities by utilizing funds from two sources. One source is an off-street parking site fund which is built up by annual appropriations of $20,000 from street parking meter revenues. In addition, it is planned that special assessments will be levied against businesses in the area to be served by the proposed lot. These assessments will help carry the cost of acquisition.

It is proposed that parking lot improvements will be financed by revenue bonds which, in turn, will be paid off by revenues from meters to be installed in the lots.

In Michigan, no referendum is necessary for a community to sell revenue bonds. (Reported by Allan T. Carlisle, City Engineer)

(To Be Continued in February Issue)

No changes in the operations, personnel or physical quarters of the Bureau of Public Roads are anticipated for the near future, as a result of the recent transfer of the agency to the Department of Commerce, according to BPR officials.

By Victor G. Hofer (Mem. ITE)
Traffic Engineer
Chicago Park District

Positive Signal Control

Too often motorists start on the amber indication before their green light, through observing the amber indication of the cross street signal. About four years ago, traffic engineers of the Chicago Park District Traffic Section, began studies, to develop a satisfactory non-reflective signal visor, which would eliminate any view of the amber indication other than the one pertaining to the individual motorist, thus precluding this hazardous practice of starting on amber before green.

After two years of extensive research a device was developed and used in the field at two heavily travelled intersections with satisfactory results. The device consists of a cylindrical visor equipped with a series of baffles in the shape of hollow frustrums, fabricated from sheet metal and spaced along the inner surface of the cylinder so that light from the signal lens cannot be reflected directly outward. To the cylindrical portion there is a rectangular plate mounted on one side so as to extend outward an additional 10 inches. This plate is also fitted with a series of baffles in the shape of inclined planes, sloping inward toward the light source. (See photograph No. 1.)

The clear opening is a standard eight inches with the overall diameter being approximately nine and three-quarter inches.

All edges of the baffles are ground to a fine edge so that the reflective surfaces are eliminated.

The interior surfaces of the appliances are sprayed with a non-reflective black paint.

The visors are adjusted so as to cut off completely the view of motorists waiting behind the cross walks, and still provide a portion of the indication to the pedestrian starting from the curb. The ideal arrangement, however, is to provide separate pedestrian walk indications as illustrated on photograph number one.

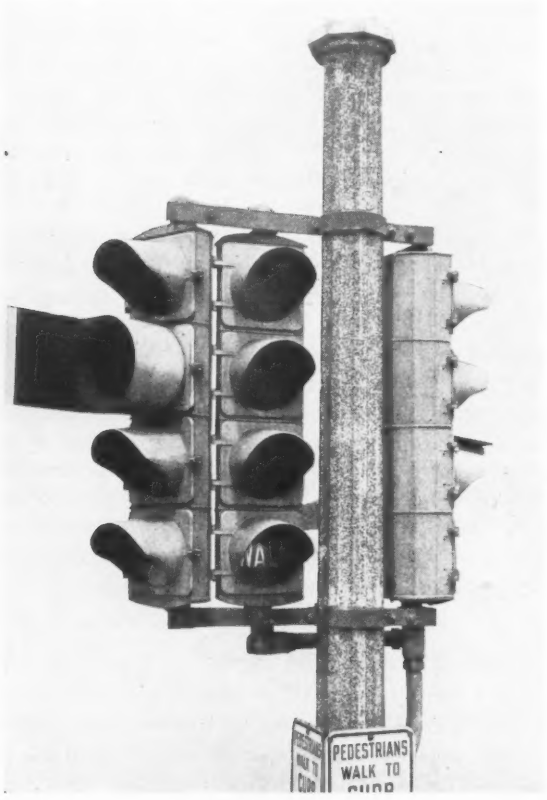


Photo No. 1

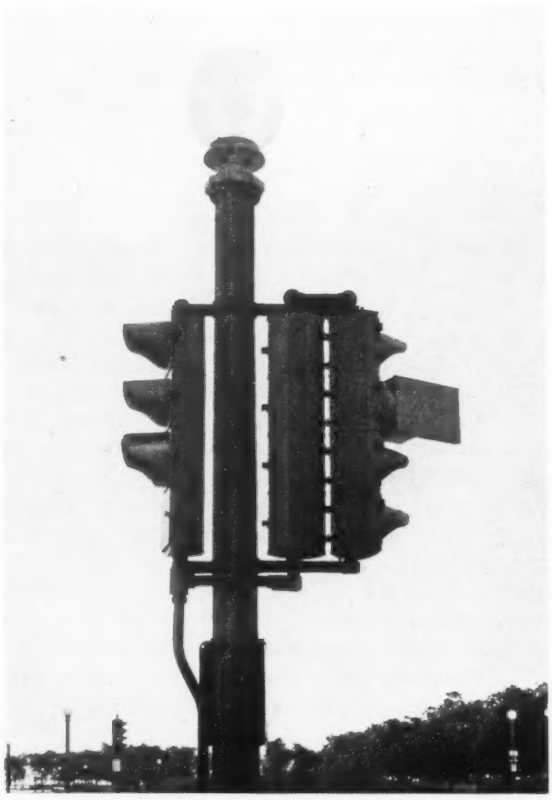


Photo No. 2

To provide maximum signal strength in the direction of traffic for which the signal is intended and to cut off the view of motorists on the cross street, the optical center line of the signal and visor is skewed approximately 15 degrees toward the center line of the intersection.

Observations made at night, with good street lighting intensity at the intersection, revealed that the amber indi-

cation could not be detected through the average windshields of vehicles on the cross street unless fog or rain existed. This condition comes about because the light is reflected directly by the water globules in the air. It was noted, however, that even during these times, very rarely did a motorist start before the signal indication had changed completely.

In photograph number two, the visor is shown mounted on the right hand side of the signal head with a flat non-reflective plate mounted atop the green signal visor. (Lower left of photo.) This plate eliminates the reflection of the amber light, to the top of the green signal visor.

These appurtenances when installed together provide positive signal control at intersections where motorists are prone to start on the amber signal before the green.

The first installation took place on Columbus and Balbo Drives in Grant Park, which is a large plaza-type intersection requiring an all-red interval in order to permit vehicles to clear. In spite of the all-red interval, an average of 11 angular accidents occurred per year, mainly because the motorist was watching the side street green amber signal. After the device was installed, no angular accidents occurred.

Another installation was made on Jackson Boulevard and Western Avenue and a before and after comparison showed 16 angular accidents in the before, to none in the after period.

Other experiments were conducted at typical intersections in the Park boulevard system with equal success and because of it, the Commissioners of the Chicago Park District have allocated $27,000 for the year 1950 for the installation of this device at the principal right angle collision points of the boulevard system.

Highway Research Abstracts
September, 1949.

ONE-WAY STREET

(Continued from page 155)

Accidents have been reduced approximately 40 per cent. The effect on the volume of business has been satisfactory. Shoppers find it much easier to park their cars since they have two sides of the street to locate vacant curb space. There has been a greater turnover of parked cars. The opinion of the business houses with two exceptions, is that one-way movement is desirable."

Dallas, Texas—"Now that the motorists and merchants are accustomed to one-way operation we doubt if anyone would be in favor of returning to two-way operation."

Elizabeth, N. J.—"Some merchants will argue. Others will be fair and willing to do anything to improve conditions because they realize it is not only for their own good but is a necessity of they want to continue in business."

Philadelphia, Pa.—"We have had one-way streets for many years. Our people are used to them and like them."

Seattle, Wash.—"We have complete approval of the Fire Department and the Transit (for proposed one-way plan)."

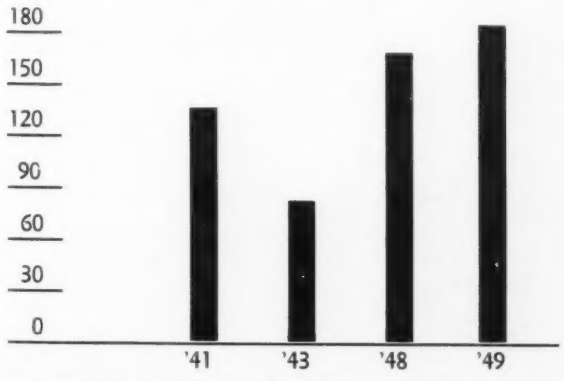
Fort Worth, Texas—"One-way system was very successful. Everyone concerned was definitely in favor of these streets being one-way after the trial period."

One-Way Streets a "Technical" Problem

If your municipality is cursed with traffic congestion and accidents caused by narrow streets and ever-increasing traffic volumes, there is hope for a solution to your problems in the one-way technique of street traffic control. A word of warning, however. Take your problem to a competent traffic authority, just as you would take a sick patient to a doctor for an effective diagnosis and cure. The planning and initiation of a one-way street system is a technical problem which should be accomplished by those trained and experienced in street traffic control. Should a one-way plan be recommended for your city, don't make the mistake of not giving the plan a fair trial. Such a trial will no doubt prove to every one in your community its great value in reducing congestion and accidents on your streets.

Traffic Trends

VEHICLE — MILES OF TRAVEL — BILLIONS



TRAVEL ON RURAL ROADS FOR FIRST TEN MONTHS OF 1941, 1943, 1948 AND 1949.

Based on Public Roads Administration Data

CITY TRAFFIC

(Continued from page 157)

When real success was being met in "selling" the citizens on safe practices, on cooperation with new controls necessary to lower the accident rate, and on general cooperation with traffic laws, there was always present a strong leadership—it could be the Safety Council, the Rotarians, the Chamber of Commerce, the Women's Club or a separate private agency especially created and *sponsored by leading citizens.* Other organizations found themselves going to this group and accepting "assignments". The radio and the newspaper accepted copy readily.

Perhaps more significant was the fact that such leadership was generally centered about *one man*—a paid full-time staff member, an executive secretary, actually carrying out the policy of the organization and directing operations.

(7) Some of the answers to the

traffic problems besetting our cities do cost money, but a surprising number of steps can be taken which are responsibly simple and require relatively modest outlay.

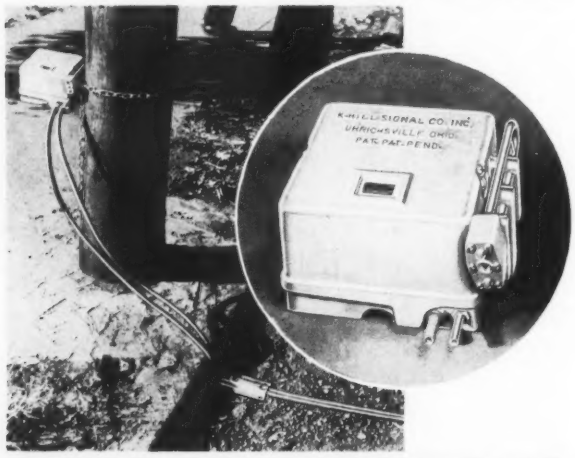
The city survey work disclosed that the cry of financial stress from cities was not entirely a valid excuse for poor traffic control. Many simple steps in better traffic control can be taken which produce large reductions in accident rates. The chief expense involved is the retaining of experienced traffic engineers to recommend the careful correction of many little things which cumulatively cause a large part of the city accident total. Such an engineer can return his salary many times over in the accident and time savings of the "little things done right", and can program, on a careful priority basis the available "big money" for the more long range projects. The very fact that a limited amount of money is to be spent demands that careful technical attention be given to each dollar spent—the most good for the least money.

(8) Overall traffic surveys are a waste of money unless the city administration really intends to do something about traffic and unless there is some one qualified person assigned the responsibility of carrying out the recommendations.

Many cases are known where civic organizations sponsored costly city traffic surveys without proper consultation with the city official responsible for the traffic program. The report was "crammed" down their throats. Is it any wonder that the report rests peacefully in the Municipal Reference Library?

The city officials must be sold on the survey and must at least appear to sponsor it.

Where there is the desire on the part of the city to do a job in traffic, there still exists the possibility that the report will gather dust on the various desks of the city departments. There must be a mechanism to keep it in action. In cities not able to afford a full-time traffic engineer to effectuate the recommendations of the survey reports, the Association's recommendations always include the advice that a consulting traffic engineer be retained to guide the operations of the Traffic Committee and the operations of the separate departments concerned with traffic. Such an engineer can be retained on a contract basis stipulating a fixed amount of time to be spent in the city each year.



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BOTH road tubes cross ALL traffic lanes.
Safer to Install.
Traffic flows normally.

Send for complete information.

K-HILL SIGNAL CO., INC., Uhrichsville, Ohio

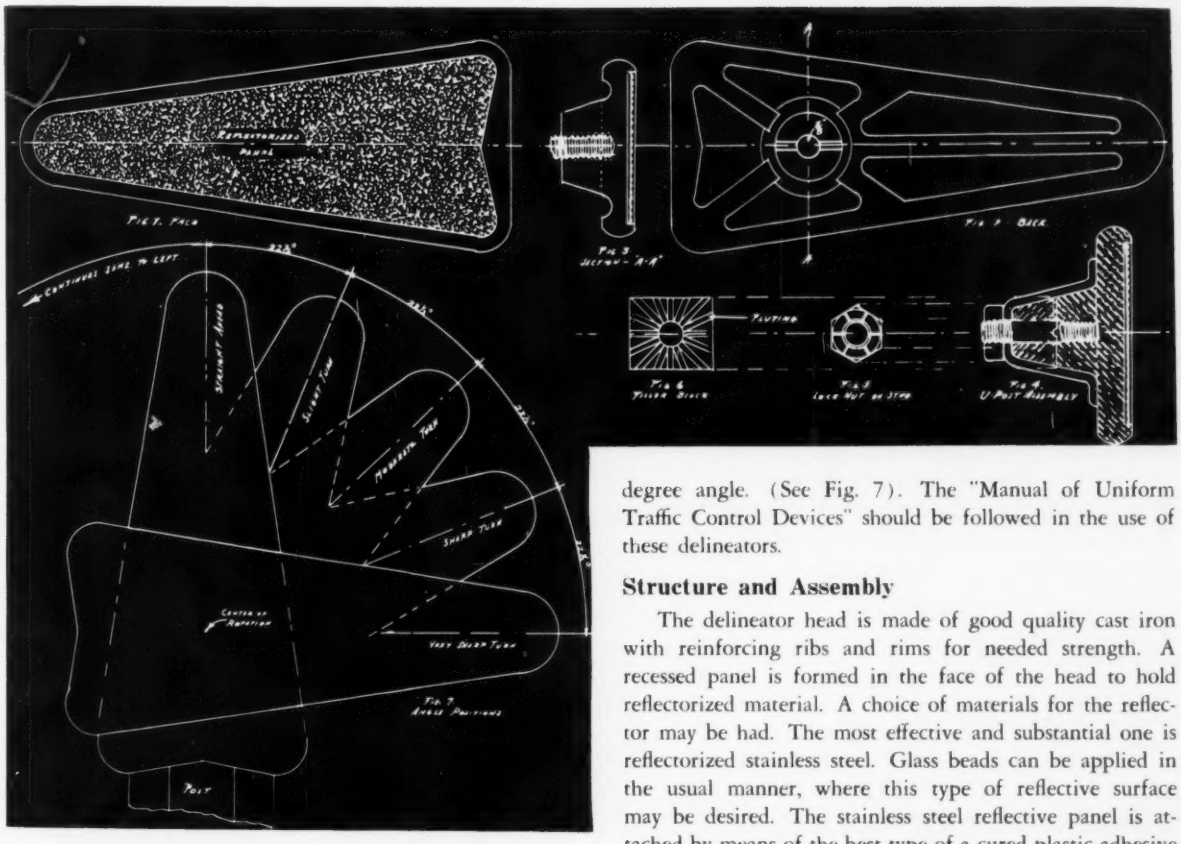
PARKING GARAGE

(Continued from page 162)

4. During the peak half hour period from 1:00 to 1:30 P.M., 81.7% of the vehicles on the entrance street entered the garage. This volume of entering traffic was equivalent to 18% of the garage capacity.
5. With 18% of the garage capacity entering the facility during the peak half hour of the "after" study, there was a corresponding increase of 280% in the volume of traffic on the entrance street and 100% of this increase in street traffic entered the garage.
6. There was an 11% increase in the volume of street traffic beyond the garage entrance during the 9-hour period of the "after" study.
7. With an average number of vehicles entering the garage in a 30-minute period equivalent to 6.4% of its capacity, there was a corresponding average increase of 72% in the volume of street traffic and 100% of this average increase entered the garage.
8. There was an average increase of 60% in the volume of left turns into the entrance street and during the peak period of left turning movements from 1:30 to 2:00 P.M., there was an increase of 132%.
9. There was an average increase of 82% in the volume of right turns into the entrance street and during the peak period of right turning movements from 3:30 to 4:00 P.M., there was an increase of 117%.
10. With a total of 627 cars leaving the garage exit, or the equivalent of 81% of the garage capacity, the facility contributed to 75% of the increase in traffic on the exit street.
11. With an average number of vehicles leaving the garage in a 30-minute period equivalent to 4.5% of its capacity, there was a corresponding average increase of 26% in the volume of street traffic and 75% of this average increase was due to vehicles leaving the facility.
12. With 13.3% of the garage capacity leaving the facility during the peak half hour of the "after" study, there was an increase of 43% in the volume of street

Open Discussion

By T. L. Johnson
President
Armor-Flex Company
St. Louis 22, Mo.



Descriptive Data

The Armor-Flex Highway Delineator shown above is especially designed and fabricated to meet exacting requirements. It not only serves for the usual highway delineation, but also gives a much needed directional guidance as well as an adequate warning.

While several uses may be found for these delineators in traffic control work, they are calculated to be used mostly on winding roads and curves in rural areas. In these uses, the delineators will be located at the proper distances in advance of the curves and the heads set at the proper angles to designate the direction and sharpness of the curve. The heads can be set and locked at any 22½ degree angle. (See Fig. 7). The "Manual of Uniform Traffic Control Devices" should be followed in the use of these delineators.

Structure and Assembly

The delineator head is made of good quality cast iron with reinforcing ribs and rims for needed strength. A recessed panel is formed in the face of the head to hold reflectorized material. A choice of materials for the reflector may be had. The most effective and substantial one is reflectorized stainless steel. Glass beads can be applied in the usual manner, where this type of reflective surface may be desired. The stainless steel reflective panel is attached by means of the best type of a cured plastic adhesive and will stand much abuse. The entire head is well protected from corrosion by a baked-on finish.

These delineators are usually mounted on standard "U"-posts but they can be mounted on wood posts. "Filler" blocks are supplied for solid attachment to steel posts. At time of erection, the delineator is set at the desired position and locked there by means of a non-removable lock nut. This prevents loss by theft or the changing of the angle at which the delineator has been set.

This company will welcome any comment and constructive suggestions, and will be pleased to furnish any additional data desired.

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traffic and 95% of this peak increase was due to vehicles leaving the facility.

13. Adequate garage reservoir space or appropriate number of attendants employed to handle the peak demands is essential if increased traffic on the streets due to cruising is to be avoided.

This article is a condensation of a thesis prepared by Mr. Armstrong while he was a student at the Yale Bureau of Highway Traffic, in the academic year 1947-48.

WORLD RUBBER CAPITAL GETS WORLD'S LARGEST STREET LIGHTS—*Akron, Ohio,* world tire champion, now boasts the biggest street lights installed anywhere. They're 25,000-lumen giants 21 inches in diameter and nearly a yard high. 65 lamps have been installed along Main Street, the city's principal thoroughfare. The entire installation of 180 fixtures is due for completion this year.

D. O. Opstad Promoted

Donald O. Opstad has been promoted to general sales manager for the "Scotchlite" division of the Minnesota Mining & Manufacturing Co., according to an announcement from the firm's headquarters here.

He joined the company in 1937 as a tape salesman, and was sales manager of traffic and safety products in the "Scotchlite" division prior to this promotion.

Frederick P. Gunning succeeds Opstad as sales chief for the safety lines. A member of the 3M organization since 1939, Gunning was eastern regional sales manager for reflective products before assuming his new duties.

Harold P. Hallock Appointed

W. H. Johnson, General Sales Manager of International Meters, Inc., Elmira, New York, announces the appointment of Mr. Harold P. Hallock as a distributor for

the Alfco Twin Automatic Parking Meter. His territory includes New Jersey, Maryland, and Washington, D. C.

Mr. Hallock is well known in the municipal field as a distributor of traffic and hospital equipment. He has specialized in parking meter distribution and in traffic engineering for control of both on and off-street parking.

Cities **BIG**

and **small**

are "switching" to...

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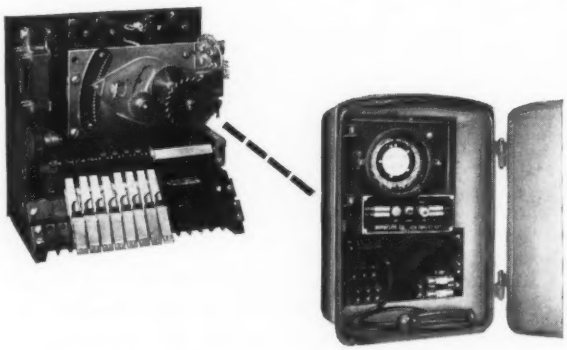
Traffic Signals and Controllers



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TRAFFIC NEWS

Traffic Engineer's Quiz

By MARTIN C. STARK (Assoc. Mem., ITE)*
Associate Technical Editor

This is the third annual quiz. It is based on the last twelve issues of TRAFFIC ENGINEERING. Please prepare an answer sheet with fifty numbered spaces. For each question you have a choice of several answers. Select one and place its number on your sheet. When you have completed the test, check your replies against the answers on page 178 and credit yourself with two points for each correct answer.

Based on previous results, a score in the 80's is excellent, one in the 70's is good, while one in the 60's is average. The author would be pleased to hear of any scores made, whether good, bad or indifferent, so that he may revise his grade curve, if necessary.

We are off!

1. A thoroughly modern, new proposed zoning ordinance for the City of Minneapolis included *all but one* of these provisions:

(1) For places of assembly there must be at least one parking space for every 10 seats in the structure.
(2) One parking space is required for every new dwelling unit in residence or apartment house districts.
(3) For business or commercial buildings or structures a parking space must be provided for every 50 sq. ft. of gross floor area excluding the basement and automobile parking space.
(4) Parking spaces shall be on the same lot with the main building or located not more than 700 feet therefrom.
(5) Spaces for public parking areas shall be paved, have bumper guards, and must observe front yard or corner lot set-backs for the district.

2. The "fix-proof" traffic ticket system, now adopted by numerous cities throughout the United States, provides that tickets be made out in quadruplicate for use by *all but one* of these:

(1) Court
(2) Police headquarters
(3) City treasurer
(4) Offender
(5) Arresting officer

3. The authority of a state department of highways to determine right-of-way widths and to take the required land, not only for present but for *future* needs as well, was recently upheld by the Supreme Court of:

(1) Virginia
(2) Louisiana
(3) Ohio
(4) Oregon
(5) West Virginia

4. Credit for the first use of a painted line to mark the center of a highway is given to:

(1) Edward Hines in Wayne County, Michigan, in 1911
(2) Wallace Fite in Fayette County, Ohio, in 1910
(3) George MacDonald in Yates County, N. Y., in 1916
(4) John Smith in Boston, in 1920
(5) Arch Bollong in Portland, in 1919

5. Dean J. Locke, in stressing the importance of urban planning for improved transit operation, listed *all but one* of these elements:

(1) Residential area within the city or in outlying suburbs should be continuous wherever the topographical features will permit
(2) The internal roadway structure of each large residential development should be of such a nature that transit service can be provided within what is considered a reasonable walking distance for the large majority of home sites
(3) The street systems of adjoining residential projects should be integrated with each other in order that they may be served by the same transit routes, if necessary
(4) Expressways, if constructed, should be located and designed for maximum usage by transit vehicles
(5) It is a basic fact that one modern motor bus has the rush-hour carrying capacity of about 15 automobiles

6. Equal credit with brother, Charles E., for designing and constructing the "horseless buggy" which was the first American gasoline automobile is deserved by:

(1) Henry Ford
(2) George M. Pullman
(3) J. Frank Duryea
(4) Walter Hunt
(5) John Herschel

7. In recognition of the fact that 80 per cent of all persons traveling on downtown Market Street in San Francisco are transit passengers, traffic signals have been retimed to accommodate transit vehicles with a resulting through-band speed of progression for off-peak operation of:

(1) 30 M.P.H.
(2) 20 M.P.H.
(3) 15 M.P.H.
(4) 11 M.P.H.
(5) 8 M.P.H.

8. During 1948, some 390 new cities put in parking meters, bringing the total number of metered cities to about:

* Research Engineer, Capital Transit Company, 36th and M Streets, N.W., Washington 7, D. C.

(1) 475
(2) 925
(3) 1400
(4) 2200
(5) 3800

9. A comprehensive traffic plan including transportation by road, rail and by foot for a "Festival, 1951" to cost at least $8,000,000 for new streets, underground passageways, escalators and motor buses to the exposition area is planned for:
(1) Washington
(2) Ottawa
(3) London
(4) Paris
(5) Chicago

10. Despite a stable population, the cars owned by Chicagoans have increased since 1931 by nearly:
(1) 10%
(2) 15%
(3) 25%
(4) 40%
(5) 60%

11. Of the 6,669 U. S. towns of 1,000 or more population, we are told that the number having no local mass transportation and relying entirely on private vehicles is approximately:
(1) 537
(2) 1,037
(3) 2,074
(4) 3,074
(5) 3,740

12. An annual cash award of $100 for the best example of "Getting Results Through Traffic Engineering" has been announced by the:
(1) **Institute of Traffic Engineers**
(2) Yale Bureau of Highway Traffic
(3) Eno Foundation for Highway Traffic Control
(4) Association of Casualty and Surety Companies
(5) Highway Research Board

13. An article discussing the needs for an additional trans-bay bridge describes the existing San Francisco-Oakland bridge as having this deck arrangement:
(1) Four vehicular lanes on a single deck
(2) Six vehicular lanes and two railroad tracks all on a single deck
(3) Six vehicular lanes on the upper deck, four tracks on the lower deck
(4) Six vehicular lanes on the upper deck, two tracks and three vehicular lanes on the lower deck
(5) Three vehicular lanes and one interurban railroad track on the upper deck for eastbound traffic and like facilities on the lower deck for westbound traffic.

14. The 20th Annual Meeting of the ITE held in Washington, D. C., drew the largest attendance in the history of the organization, attracting nearly this number of highway and traffic engineers and their wives from all parts of the United States.
(1) 100
(2) 200
(3) 400
(4) 600
(5) 850

15. "Model 10" identifies what is regarded by experts to be the last word in design of:
(1) Automobile body
(2) Diesel locomotive
(3) Railroad grade crossing safety device
(4) Traffic signal timer
(5) Parking meter

16. Motor vehicle registration for 1948 reached a new peak of 40,500,000, exceeding the pre-war record of 1941 by about:
(1) 3,000,000 units
(2) 6,000,000 units
(3) 10,000,000 units
(4) 15,000,000 units
(5) 25,000,000 units

17. A plan recently installed in New Haven by Edmund Ricker attracting considerable attention is:
(1) A ban on all curb parking in the downtown area during the daytime
(2) A program of staggered work hours
(3) The establishment of a number of city-owned and city-operated parking lots
(4) Central delivery-truck service by the principal stores
(5) An extensive one-way street system

18. An article on four-way stop control in Illinois suggests *all but one* of these points:
(1) Where volume of traffic is the primary factor, four-way stop control may be considered an intermediate step in intersection control between the common two-way stop and the traffic signal
(2) Illinois has found it advantageous to add supplementary message "4-way" in the upper panel above the word "STOP" on each of the four signs.
(3) A survey of public opinion as to four-way stop control indicated a favorable reaction from more than 90% of the motorists
(4) Each district office offered the general comment that accidents have been greatly reduced both in number and severity following the change from two-way to four-way stop control
(5) This type of intersection control has no place in rural areas where approach speed is the primary factor and volume is secondary

19. The Quiapo pedestrian overpass, costing 18,000 pesos, opened May 26, 1947, and now carrying peak loads in excess of 7,000 pedestrians per hour, is the first of its kind in this city:
(1) Sao Paulo, Brazil
(2) Acapulco, Mexico
(3) Manila, P. I.
(4) La Paz, Bolivia
(5) Calcutta, India

20. A comprehensive origin-destination survey of the home-interview type, if it includes transit route data, should assist transit organizations in the determination of *all but one* of these factors:
(1) Need and location of new routes or relocation of present routes
(2) Whether there is sufficient volume for the substitution of direct service for indirect service
(3) Average length of ride which can be used, primarily, as a basis for proportioning the amount of local and express service on any particular line and, in some cases, as a controlling factor in the rate of fare
(4) Location of terminals in downtown and outlying areas
(5) Appropriate working conditions for the street car and bus operators

21. "Para-Park" is the name of a new, patented parking system which utilizes the following principle:
(1) Cars park at the curb in pairs bumper to bumper with a comfortable space between each pair
(2) A simple arrangement of inclined parallel planes in a parking lot or garage enables two automobiles to utilize the same projected area, one right over the other
(3) A parking "roundhouse" is served by a turntable in the center of the lot
(4) Cars are guided into their stalls in a parking garage by robot controls
(5) The parking area is comparable to a large rotating stage greatly cutting down on space needed for maneuvering

22. In an article on "Primary Highways", Hal H. Hale made *all but one* of these statements:
(1) Our national highway system has contributed heavily to our welfare with reference to the fields of present educational system,

mail delivery and communication, facility and economy of moving commodities, health service, rural mobile library service and fire protection

(2) The present conservatively appraised value of our 34,000,000 automobiles and 7,000,000 trucks and buses of $32 billion is about the sum we have invested in our highway system during the last 30 years

(3) About 78 per cent of all cars in the world are in the United States

(4) Public Roads Administration developed a composite-mile construction cost index for the second quarter of 1948 equal to 210.5 as against 100 in 1940

(5) The federal-aid primary and secondary highway systems constitute 90 per cent of all roads and streets in this country

23. The completion of the technical evolution of a polarized headlight system consisting of polarized filters on two 125-watt headlamps and a viewer-filter before the driver's eyes has left this problem, discussed by Lewis W. Chubb, Jr., as not yet completely solved:

(1) Open road visibility of critical hazards seen through the viewer will not be so good as present open road seeing with the upper beam

(2) The period of transition to the polarized system will introduce hazards much more serious than those found in the current transition from pre-sealed beam to sealed beam lamps

(3) The cost of the polarized light system will be out of line with the benefits obtained

(4) The polarized viewer is capable of entirely eliminating the atmospheric glow now frequently noticed in night driving and serving as an important warning to many motorists when an opposing car is nearing a hilltop or curve ahead or is in a "dip" in what has seemed a straight, level road

(5) The need for a heavier and larger generator presents a serious design problem

24. For pavements having a reflectance as low as 5 per cent, the Illuminating Engineering Society recommends that straightaways as well as intersections on important roadways should have a minimum average illumination of:

(1) 0.8 foot-candle
(2) 8 foot-candles
(3) 80 foot-candles
(4) 800 foot-candles
(5) 8,000 foot-candles

25. Andrey Abraham Potter, Dean of Engineering, Purdue University, shares a distinction with Paul G. Hoffman, Thomas H. MacDonald and Charles J. Tilden by virtue of his being:

(1) A native of New England
(2) A committee chairman under the President's Highway Safety Conference
(3) An honorary member of ITE
(4) A Beecroft Memorial Lecturer
(5) A full professor of highway engineering

26. Margaret Shannon has made a great contribution to traffic safety in Atlanta, Ga., in her role as:

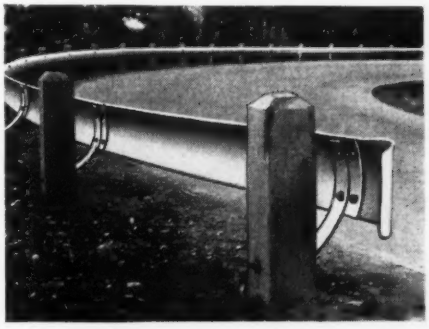
(1) One of the few women traffic consultants in the country
(2) Author of a series of stories in the **Atlanta Journal** about the city's traffic problems
(3) A judge in traffic court
(4) Chairman of the Citizens' Traffic Commission
(5) A philanthropist whose gifts have made it possible for driver training instruction to be offered in all high schools in the city

27. This city has considered a new revenue-producing city hall which might lease ground floor store locations and might operate two or three of the upper floors as decks for parking automobiles at a small fee:

(1) Rochester, N. Y.
(2) Denver
(3) Wichita
(4) Miami, Fla.
(5) Boston

28. A novel type of traffic engineering conference where the delegates listened for two days to lectures by Ted Matson and Wilbur Smith was held May 19 and 20 at the:

(1) 20th Annual Meeting of the ITE in Washington, D. C.
(2) First Colorado Traffic Engineering Conference
(3) Traffic Engineering Section of Greater New York Safety Council
(4) Tenth Annual Conference and Exposition of the Southern Safety Conference in Tampa
(5) Traffic Engineering Division, Michigan Safety Conference



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Resilient convex steel rail safety deflects cars back on the road Low-mounted springs absorb impact, minimize damage to car and occupants

Maximum STRENGTH
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Maximum VISIBILITY
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29. Realizing that the movement of people, not vehicles, is the ultimate solution to the traffic dilemma, all but one of these cities are cited as emphasizing the use of modernized public transit as the spearhead of their anti-congestion campaigns:
(1) San Francisco (4) Washington
(2) Chicago (5) Philadelphia
(3) Cleveland

30. The Municipal Year Book (1946) reports that of the 277 cities over 10,000 population reporting on the disposition of parking meter revenues, the large majority:
(1) Use the money for general traffic improvements
(2) Use the money for providing off-street parking facilities
(3) Credit the money to the general fund
(4) Credit the money to the police department budget to offset the salaries of parking enforcement officers
(5) Report no appreciable net income from meters

31. A group picture of Messrs. Batts, Dobelek, Gibson, Gourlay, Hanson, Harger, Kansman, LeRoy, Malo, Petterman and Ronan represents the recently reorganized traffic engineering bureau of:
(1) Los Angeles (4) Philadelphia
(2) New York (5) Cleveland
(3) Detroit

32. During a recent man-made storm in a research laboratory where a 3,000,000-volt charge of lightning was fired at a passenger auto the result was that:
(1) The engineer who sat at the wheel was killed instantly
(2) The engineer was momentarily stunned but recovered a few minutes later
(3) Only a small scorched spot on the car's metal top remained as evidence of the test
(4) The entire body of the car showed heavy scorch marks but driver was untouched
(5) There were no noticeable effects whatever

33. Last summer the Yale Bureau of Highway Traffic, and traffic engineering in general, received one of the best possible publicity boosts when featured as news-of-the-day in:
(1) LIFE
(2) TIME
(3) COLLIER'S
(4) CORONET
(5) MARCH OF TIME

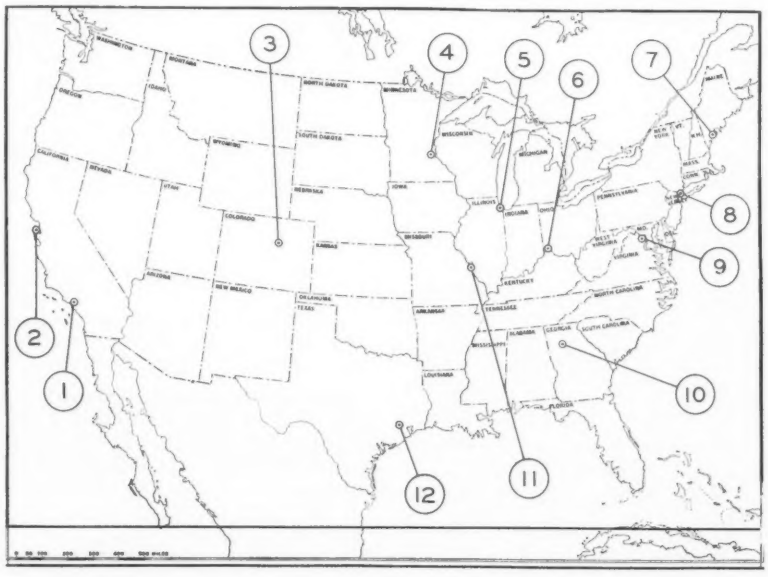
34. With a net addition of about 40 new members during the last fiscal year, the ITE membership as of October 1, 1949, was:
(1) 298 (4) 545
(2) 388 (5) 693
(3) 460

35. The "Traffic Trend" data furnished by the Public Roads Administration indicate that the vehicle miles of travel on rural roads for the first ten months of 1949 are running about:
(1) Even with same period of 1948
(2) Seven per cent higher than same period of 1948
(3) Twenty per cent higher than same period of 1948
(4) One-third higher than same period of 1948
(5) Double the corresponding 1948 figure

36. In an article on truck transportation, Dwight McCracken made in substance *all but one* of these statements:
(1) A truck has an effect on the traffic stream equivalent to that of two passenger cars
(2) Whereas in 1939, 80 per cent of textile shipments on the 1000-mile haul between the Southern textile mills and the New York garment factories moved by rail and 20 per cent by truck, now in 1949, it is running 50-50
(3) Thirty-two universities throughout the country conduct motor vehicle fleet supervisor training courses annually where a total of well over 1000 fleet safety supervisors study safety and efficiency of truck operations for a full week
(4) Insurance companies' claim files reveal that very few accidents involving disabled trucks occur where warning flares have been displayed in accordance with modern codes
(5) Truck insurance companies pay millions of dollars yearly for accidents at diners or gas stations poorly located with respect to access and sight distance.

37. A two-division traffic engineering department, manned by 27 people, operating on an annual budget of about $200,000 and hailed as a model for all cities over 100,000 population has been newly set up in:
(1) Salt Lake City (4) Sacramento
(2) Providence (5) Austin
(3) Toledo

38. The "Autopullman" is described by Camille L. Follis, in writing about Italy, as a:
(1) Sort of over-sized bus used for fast, over-the-road operation
(2) Gasoline-driven street car
(3) Bus with compartments that can be made up to provide comfortable sleeping berths
(4) Beautiful, modern parking garage in Venice, offering all-night service and extensive facilities for the repair and maintenance of vehicles
(5) Double-deck trolley bus



Referring to the map of the United States, select the correct location for each of the following events and indicate location number on your answer sheet.

39. This city has been selected for the ITE convention in 1950
40. A 3-mile section of urban expressway which is fed by four one-way city streets was opened here late in 1948
41. The new Institute of Transportation and Traffic Engineering was organized here recently
42. This was the scene of America's first automobile race November 28, 1895
43. Here a one-mile portion of a 3-lane roadway was signalized in September, 1949, providing individual signal indications for each lane and permitting a controlled reversible use of the center lane
44. The second annual Hot Rod Exposition and Automotive Equipment Show ran for ten days last January in the National Guard Armory of this city

45.

46.

47.

48.

49.

50.

Directions: Each of the six pictures shown below is identified by one of the following phrases. Write on your answer sheet (opposite the number of each picture) the number of the correct phrase.

1. President of the Automotive Safety Foundation
2. Associated with the Crouse-Hinds Company since 1915 and now the manager of their Traffic Signal Department
3. Formerly from Detroit, now the director of the newly created Department of Traffic Engineering in New York
4. Formerly with the American Transit Association and now a consultant
5. Traffic engineer for the Commonwealth of Massachusetts for nearly 25 years
6. Charter member and third president of the ITE, who has included in his versatile activities street and highway design, public utilities operation, city planning, motor club management, college professor and consulting engineer
7. Traffic Engineer of Buffalo and currently officer of the ITE
8. Newly appointed executive director of the International Road Federation, whose sideline until last year was the editorship of TRAFFIC ENGINEERING
9. On the staff of the National Safety Council for 31 years and a charter member of the ITE
10. Long in traffic work, now professor of civil engineering, George Washington University, Washington, D. C.
11. Head of the Division of Traffic and Safety of the Ohio Department of Highways for nearly 20 years
12. An early leader in the field of traffic control, organizer and director of the Yale Bureau for Highway Traffic (originally at Harvard), formerly president of the Mutual Broadcasting System, and now president of Instructional Films, Inc.

The average man, woman and child who lives in city areas rides a streetcar, trackless trolley or bus about 270 times a year.

Association Appoints New Staff Member To Accident Prevention Department

The appointment of S Kirklen Collins to the staff of the Accident Prevention Department, Association of Casualty and Surety Companies, has been announced by J. Dewey Dorsett, Association general manager. Mr. Collins is assigned to the Department's safety education division, and will devote most of his time to the field of high school driver education, in connection with the Association's rapidly expanding program of training teenagers in safe driving practices.

Mr. Collins brings to the Association a wide experience in both industrial and traffic safety. Formerly head of the safety department of the Shell Development Company, he subsequently became an industrial field representative for the National Safety Council. Later he joined the Safety Education Bureau of the California Department of Motor Vehicles, where he was active in organizing community safety councils and promoting public interest in traffic accident prevention throughout the state.

More recently Mr. Collins has been a member of the staff of New York University's Association-endowed Center for Safety Education, and conducted driver training institutes for high school teachers in California, Georgia, Massachusetts and New York. He holds a Masters Degree from the Center. He is a member of the American Society of Safety Engineers and has contributed several articles to safety publications.

1950 Annual Meeting

Announcement was recently made officially establishing the time and place for the Institute's 21st Annual Meeting. The Commodore Hotel has been selected by the Local Arrangements Committee for the meeting to be held in New York City, September 23-27, 1950. The possibility of another World Series in the "big town" next year forced a change from the previous dates set for a week later.

SECTION NEWS

Michigan Section

The Michigan Section held a dinner meeting at Lansing, November 9, 1949. A new attendance record of 48 persons was set.

Harold Bauerle, Vice-President and chairman for the evening, presented State Highway Commissioner Charles M. Ziegler who spoke to the group on the value of a good traffic engineering division within any highway administration.

Following this address, a movie on deer hunting was shown. The film was prepared by the Michigan State Conservation Department.

The next meeting will be held in Ann Arbor in January, 1950.

Arthur Gibson,
Secretary-Treasurer

New England Section

On November 9th, the New England Section held its first Fall meeting at the Old Colony Restaurant in East Hartford, Connecticut. This was the first meeting to be held outside of New Haven and was well attended by twenty-eight members of the Section, the Yale University Student Chapter, and guests. The occasion was a joint meeting with the Highway Planning Officials of the North Atlantic States. The "round-table" forum on the role of planners in highway traffic administration, led by Curt Hooper, Director, Connecticut Bureau of Highway Planning, resulted in a spirited discussion between the panel and the audience. The group photo shows the "panel" leading the discussion: seated, left to right, E. S. Metcalf, Maine Highway Department; Tom Reid, Massachusetts Highway Department; Les Manning, State Highway Planning Engineer, R. I. Department of Public Works; Curt Hooper; David Fosburgh, Planning Survey Manager, New Hampshire State Highway Commission; Ed Ricker, President, New England Section; H. F. Farrington, Manager, Highway Planning, Vermont Department of Highways; Peter Hale, Secretary-Treasurer, New England Section; Joe Cressy, Traffic Engineer, Massachusetts Department of Public Works; Fred Eaton, Director, Planning Division, Maine State Highway Commission; Fred Auer, New Hampshire Highway Department; Dave Johnson, Connecticut Highway Department. Other members of the Section, and guests, are grouped together in the background.

Peter P. Hale,
Secretary-Treasurer

Washington Section

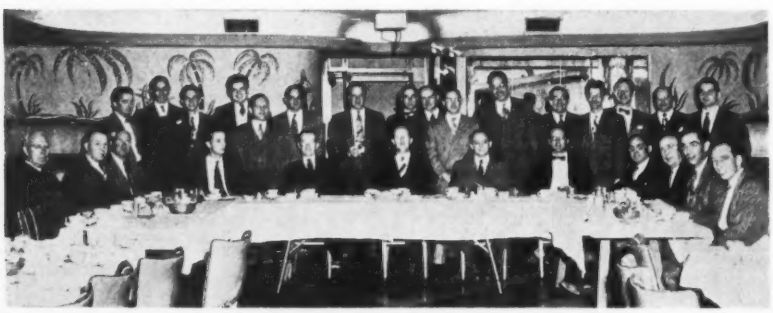
The Washington Section held its second meeting of the 1949-50 season on October 26th at the Hotel Fairfax club studio. The Section featured "movie night". Featured films were: "One Way Only"—a film produced by the British Road Federation; "Pennsylvania Pilot Study"—on size and weight of trucks—produced by Bureau of Public Roads on the Pennsylvania Turnpike and parallel roads; "Indianapolis Speedway"— produced by Firestone; and "Horizons Unlimited"—produced by the National Highway Users Conference.

Bill Boardman,
Secretary-Treasurer

Western Section

The Northern California Group of the Western Section held a dinner meeting on November 28th, preceding a technical seminar sponsored by the University of California Institute of Transportation and Traffic Engineering. Fifty-six members and other persons interested in traffic engineering attended the meeting. Ross Shoaf, Chairman of the Northern California group, presided at the dinner. "Skinny" DeYoung, as usual, acted as host at the pre-dinner "refreshment" session. The technical session dealt with Techniques of Estimating Induced Traffic, with John Olayos, Assistant District Traffic Engineer, District IV, Division of Highways, as the main speaker. Mr. Olayos furnished each person in attendance with a report about twenty-five pages long, describing techniques used in the District IV office. Following Olayos' presentation, Sam Osofsky and James T. McWilliam of the Planning Division, Traffic Department, Division of Highways, Sacramento, described the new coordinate method of using machine tabulation of O-D information in assigning traffic to proposed facilities. Ross Shoaf briefly described techniques used by DeLeuw-Cather in assigning traffic to proposed freeways in San Francisco. There were numerous questions from the floor, with the meeting lasting until 10:15 P.M.

Reported by Donald S. Berry



ITE Car Emblems Available

At the Annual Meeting of the ITE in Washington, D. C., the Reflexite Corporation distributed reflectorized car emblems to the members only. These emblems are approximately three inches in diameter and are designed similar to the ITE pin. Attachments are included to secure the emblem to the front or rear license plate, or rear compartment. They are available to *all* ITE members and can be obtained at no cost by forwarding your request to: Reflexite Corporation, 39 South Avenue, New Canaan, Conn.

Secretary's Column

Once again we return to the regular "column" of your Executive Secretary —the last one having appeared in the September 1949 issue. First, on behalf of your Executive Secretary and Headquarters' staff, we wish to extend our sincere appreciation for the many fine greeting cards during the holiday season. We wish it were possible to express individual greetings to each member. In lieu of this we take this opportunity to wish all members and subscribers a happy and successful year.

In view of the recent meeting of the Board of Direction, held in Washington, D. C., on December 13th, we take this opportunity to renew our standard practice and report this meeting herein.

There were eight Board Members present, including President Smith and Vice-Presidents Cherniack and Neal. In the absence of the Secretary-Treasurer, the Executive Secretary submitted his written report for him. Based on prior Board instructions, it was recommended that the Executive Secretary be bonded in an amount suitable to the financial operations of the Institute. This will afford protection to both the Institute and the Executive Secretary. The Board also approved recommendations of the Secretary-Treasurer and the Executive Secretary relative to outlining the duties and responsibilities of these two offices. These responsibilities will be used as a guide by the Executive Secretary, the Secretary-Treasurer and the Board until such time as the Board deems it essential to include such provisions as a permanent part of the Constitution and By-Laws. This action will serve to clearly define the joint responsibilities of the offices directly concerned.

Your Executive Secretary briefly reviewed the status of "Traffic Engineering" magazine to date. It was reported that advertising contracts would adequately meet the budget established at the beginning of the fiscal year, with a possibility that the budget may be exceeded. The Secretary further reported the results of the ballot on amendments to the Constitution and By-Laws canvassed on December 1, 1949. These amendments were almost unanimously accepted, assuring geographical representation of Directors in the next elections.

Vice-President Neal, Chairman of a Special Board Committee, submitted a report on investigations pertaining to a commercial audit and a change in the Institute's fiscal year. The Board officially approved a continuing commercial audit of Institute accounts, beginning at the end of the current fiscal year. This recommendation was originally submitted by the Finance and Auditing Committee, which will be discontinued in view of the action taken. The Board further accepted the special committee's recommendation to change the Institute's fiscal year to January 1st, without affecting the existing election year. The only change to be effected in the Constitution and By-Laws is the matter of billing annual dues. The details of this change will be reported to all ITE members at a later date.

Mr. Mitchell, Chairman of the Editorial Board, indicated that the revised "Traffic Engineering Handbook" is nearing completion and that distribution could be expected by the first of June. The Board authorized a new Student Chapter at Cornell University, the fourth active chapter now in existence.

Mr. Wetzel, Chairman of the Local Arrangements Committee for the 1950 Annual Meeting, personally appeared before the Board and presented a detailed report on activities of his committee to date. From all indications, the New York group expects to surpass the efforts of the Washington Section in producing a first-class Annual Meeting. Several new members were elected at this meeting; their names and grades will be reported in an early issue of "Traffic Engineering" magazine. It was the decision of the Board to hold its next meeting in Memphis, Tennessee, in connection with the Southern Safety Conference early in March.

Robert S. Holmes

Dual Introduces New Off-Street Parking Meters

Newly developed parking meters, designed especially for off-street metered parking service, have just been officially announced by The Dual Parking Meter Company of Canton, Ohio.

Although the new meters register coin-purchased time up to 12 hours per setting, they are in outward appearance virtually identical to the Dual 1-to-2-hour meters which control street parking in so many hundreds of cities today. Dual officials point out that, aside from almost identical appearance, practically all of the mechanical and component parts are likewise identical in order (1) to simplify and minimize maintenance and servicing in municipalities equipped with both on and off-street Duals, and (2) to permit the same operational features achieved in Dual on-street meters. It is also believed that motorists already familiar with the simple operation of the on-street units will thus be spared possible confusion and loss of time during the introduction of off-street metered parking.

According to J. A. Moran, Dual vice-president in charge of sales, expanded off-street parking appears to be the only practical solution to a problem growing more serious each day in hundreds of congested business areas. In many cases, lack of adequate parking facilities is already leading to serious decreases in the utilization and valuation of business properties. Thus, he points out, there is now a widespread trend to provide off-street parking facilities, and for many reasons metering of the available space offers easily the most efficient, most economical control.

Mr. Moran further states that although general announcement of his company's off-street meters has been withheld until now, full production is under way and highly successful installations have already been made in a number of cities. A new descriptive bulletin, No. DU-505, is now available on request.

Answers to Quiz

1. 3	11. 3	21.2	31. 3	41. 2
2. 3	12. 4	22. 5	32. 3	42. 5
3. 2	13. 4	23. 4	33. 5	43. 9
4. 1	14. 3	24. 1	34. 3	44. 1
5. 5	15. 3	25. 3	35. 2	45. 8
6. 3	16. 2	26. 2	36. 4	46. 12
7. 4	17. 5	27. 4	37. 2	47. 3
8. 4	18. 5	28. 5	38. 1	48. 9
9. 3	19. 3	29. 4	39. 8	49. 2
10. 4	20. 5	30. 3	40. 12	50. 5

LOOKING AHEAD

January 23-February 10, 1950— LOS ANGELES, CALIFORNIA
Western Institute for Traffic Training. Los Angeles campus of the University of California. Institute of Transportation and Traffic Engineering, University of California, Berkeley 4, California.

January 30-February 1, 1950— LOS ANGELES, CALIFORNIA
California Institute on Street and Highway Problems. Los Angeles campus of the University of California. Institute of Transportation and Traffic Engineering, University of California, Berkeley 4, California.

March 5-7, 1950 — MEMPHIS, TENNESSEE
Southern Safety Conference, Peabody Hotel. Secretary-Treasurer, 2120 First Avenue, N., Birmingham 3, Alabama.

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Position Available

Superintendent of Traffic, Municipal Railway, Class S126

SALARY: $700 per month for a 5-day week of 40 hours.

AGE: Appicants must be 21 years of age or over on the last day for filing applications. Compulsory retirement age effective July 1, 1952 is 65 years. (Retirement age now in process of being reduced yearly from age 70 to age 65.)

NOTE: Residential requirements have been waived for the examination. *An applicant need not be a resident of San Francisco, but must be a citizen of the United States.* The Civil Service Commission will endeavor, wherever possible, to make arrangements to hold the written and oral examinations at convenient places throughout the United States.

LAST DATE FOR FILING APPLICATIONS: February 28, 1950

BEGINNING DATE OF EXAMINATION: March 31, 1950

The date of the written examination may be subject to change. Qualified applicants will be notified by mail of the exact date, time, and place to report for examination.

DUTIES OF POSITION: S126 SUPERINTENDENT OF TRAFFIC—MUNICIPAL RAILWAY

Under general administrative direction of the General Manager of the Railway: has charge of and is responsible for the activities and functions of the Schedule and Traffic Department of the Municipal Railway; develops and revises transportation schedules for street cars, cable cars, electric coaches, gasoline or diesel buses, etc., and checks and verifies such schedules, and in connection therewith directs and analyzes transit and traffic studies, and prepares statistical and other reports from the information resulting from such studies; cooperates with the City Planning Commission, San Francisco Police Department, and other public or private organizations in making special studies for improvement of public transportation, e.g., functional use of streets, vehicle volume, business district cordon count, curb parking, shopper transportation, business density and industrial employment, resident population density, passenger car registrations, public opinion polls, staggered hours, etc.; acts as liaison officer in matters pertaining to transit and general traffic between the Municipal Railway and City Planning Commission, San Francisco Police Department, and the City Engineer's Office; and performs related duties as required.

DESIRABLE QUALIFICATIONS:

1. Graduation from a recognized university or college, and at least five years of successful full time paid experience within the last eight years of progressively increasing responsibility in modern methods and practices of schedule and traffic planning for a major* street railway or bus transportation utility, two years of which shall have been in an executive position involving responsibility for directing the schedule and traffic work, or as the major assistant to such an executive; or

2. Some combination of education and experience deemed to be similar or equivalent by the Civil Service Commission.

*A major street railway or bus transportation utility is considered to be one which, operating an urban and/or interurban service, has not less than approximately 300 vehicles operating over 400 route miles.

NOTE: Periods of time stated under Desirable Qualifications above, within which the applicant should have had specified experience, will be extended for veterans of the armed forces to include the period of military service.

For further information direct your inquiry to San Francisco Civil Service Commission, Room 154, City Hall, San Francisco, California.

Islands are potential ✕ spots and should be clearly marked with

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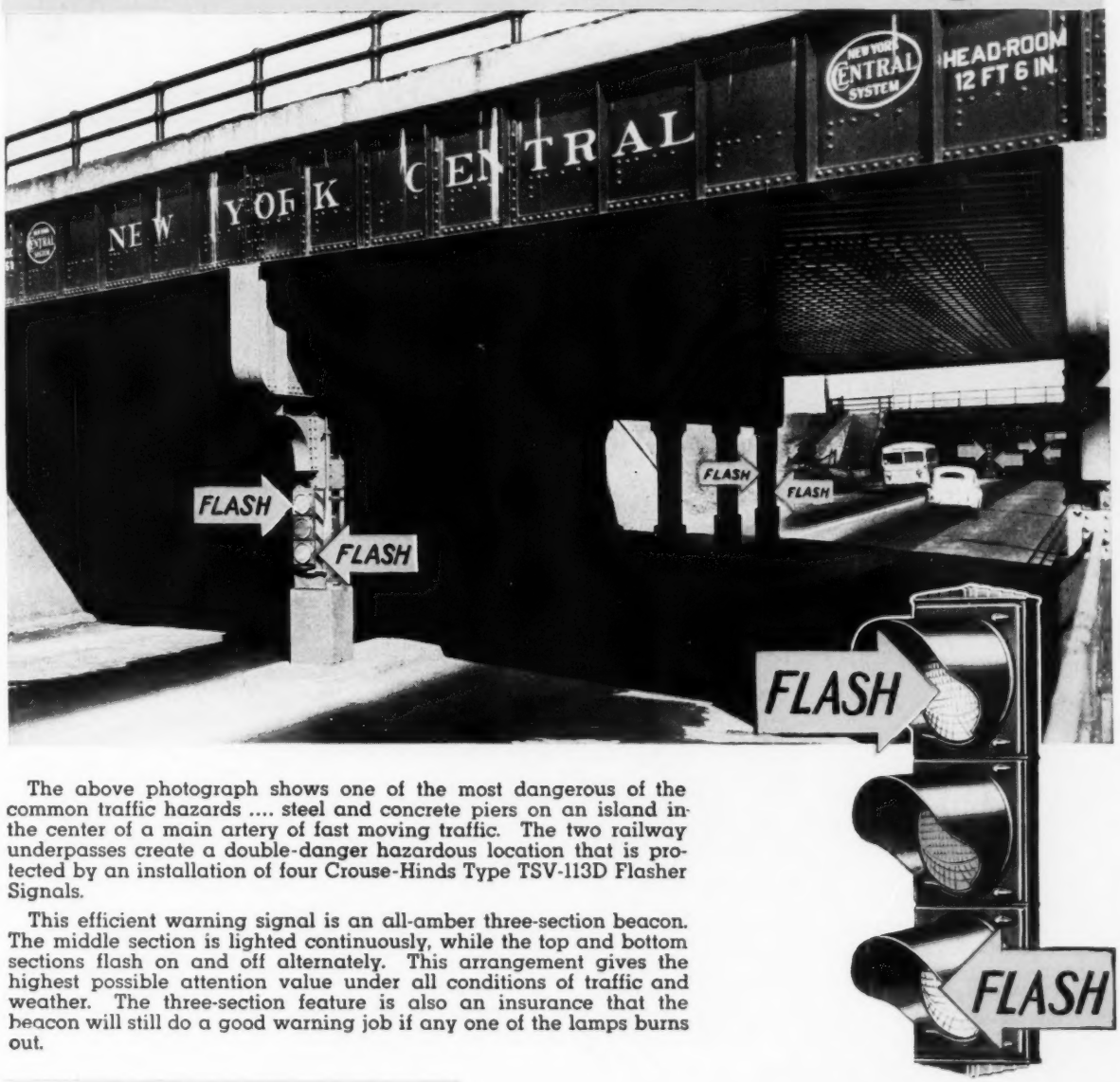

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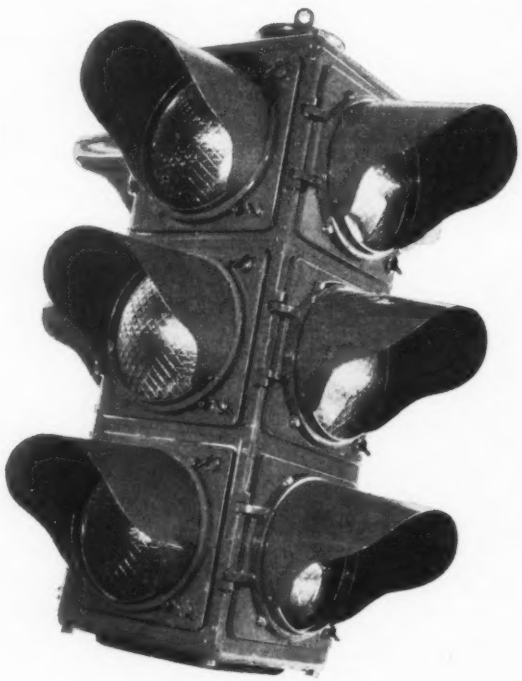

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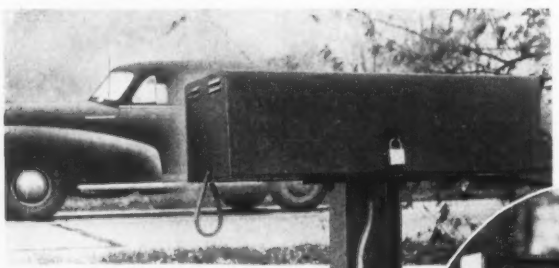
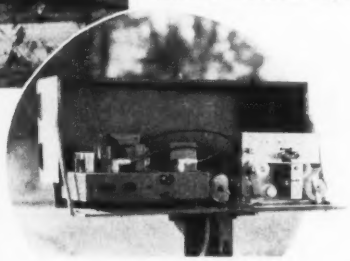


Below: Counter Open



Here is the improved Permanent Station Traficounter—the latest in the line of Traficounters Streeter-Amet has developed over a period of many years. All highway departments who have relied on Streeter-Amet for help in their traffic problems will appreciate the many advantages of this new Traficounter. The detection is not affected by any weather —snow or ice. It is designed especially to eliminate rubber tubes or treadles. It detects vehicles at high or low density of traffic.

AUTOMATIC WEIGHT RECORDERS SINCE 1888

Write for information regarding this permanent Station Traficounter.

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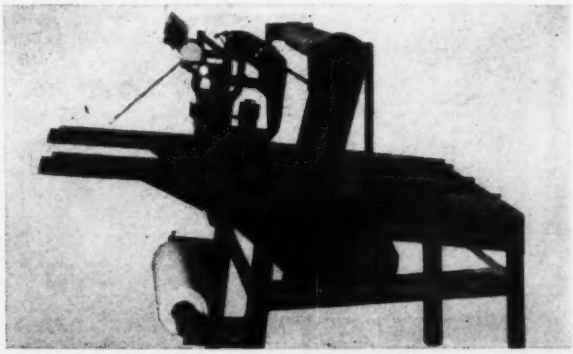
"Make better signs faster, at lower cost with this adhesive coated reflective sheeting!"

JUST PEEL OFF protective backing of this new "Scotchlite" Reflective Sheeting to expose the dry adhesive. It's pre-coated under factory control to assure a smooth, even coating.

SIMPLY APPLY ACTIVATOR to exposed adhesive and sheeting is ready for hand application to flat signs. No separate adhesive cans, brushes, spray guns, drying racks!

NO ACTIVATOR NEEDED with the "Scotchlite" Brand Vacuum Applicator. Heat from applicator activates new-type adhesive. Simply position the sheeting . . . everything else is automatic!



"SCOTCHLITE" BRAND SQUEEZE ROLLER removes protective backing and applies activator *automatically*. Power drive permits continuous production with greater output per operator. Spraying, brushing, drying of adhesives is eliminated!

BETTER SIGNS AT LOWER COST—"Scotchlite" Wide Angle Reflective Sheeting with Type 2 Adhesive lasts over *twice* as long as ordinary sheetings, maintains original brightness over entire lifetime. Get full details about this new cost-cutting sheeting plus "Scotchlite" Brand Vacuum or Squeeze Roller Applicators from Dept. TE-20. Write today!

REG. U. S. PAT. OFF.
SCOTCHLITE
BRAND
REFLECTIVE SHEETING

ANOTHER 3M PRODUCT

MADE IN U. S. A. BY
MINNESOTA MINING & MFG. CO., St. Paul 6, Minn.

also makers of "Scotch" Brand Pressure-sensitive Tapes, "Centerlite" Reflective Compound, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives.

General Export: DUREX ABRASIVES CORP., *New Rochelle, N. Y.*
In Canada: CANADIAN DUREX ABRASIVES LTD., *Brantford, Ontario*

Lyle

SIGNS COST LESS IN THE LONG RUN

THE MEN who are responsible for the erection and maintenance of signs are the best judges of sign values. They know the function of signs . . . and accordingly they know the qualities signs must have in order to serve their purpose.

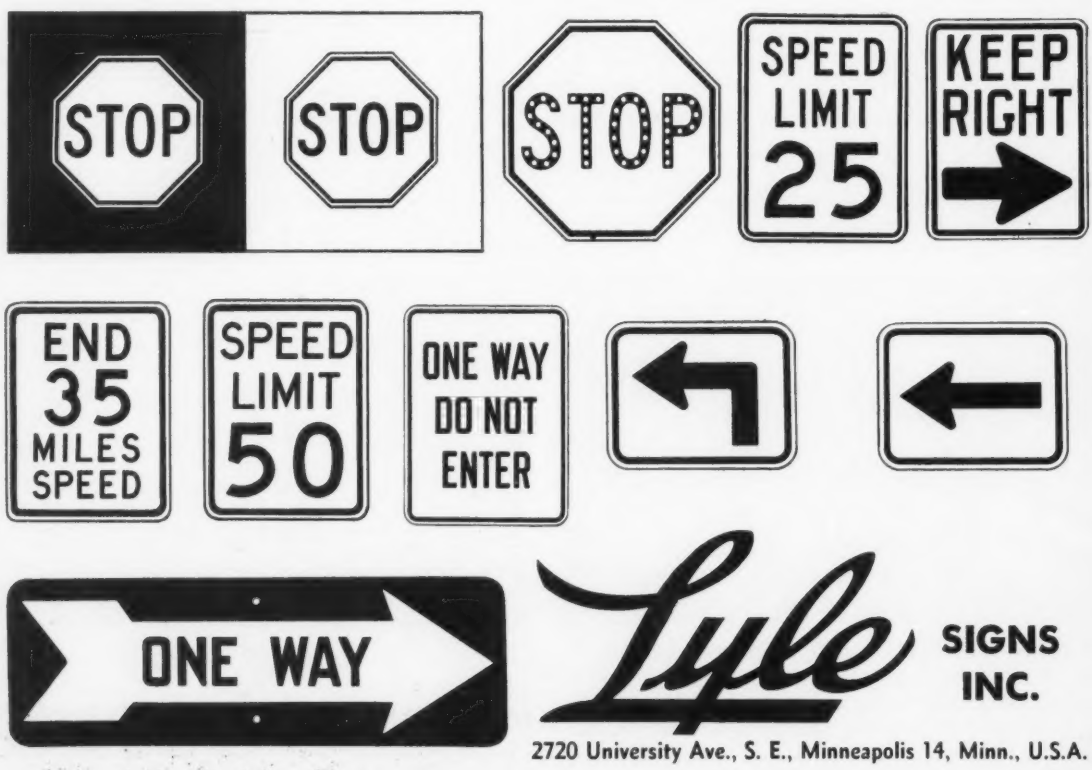
Signs carry messages to people. They give out warning, orders, instructions . . .

Therefore they must arrest attention . . . command respect . . . enforce their meaning . . . not only during the first week of their erection but for all the days in the future.

A sign must be quality built to do this job . . . to remain bright, shining and noticeable . . . for the only signs that are obeyed are those people notice.

35 years of sign design and manufacture go into Lyle Signs. This priceless, experienced "know how", builds into Lyle Signs these qualities that make Lyle Signs last longer, stay bright . . . and do a better job of functioning as a sign.

May we quote on your requirements . . . on Lyle Signs that cost less in the long run.



Lyle SIGNS INC.

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